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The AUTOMOBILE

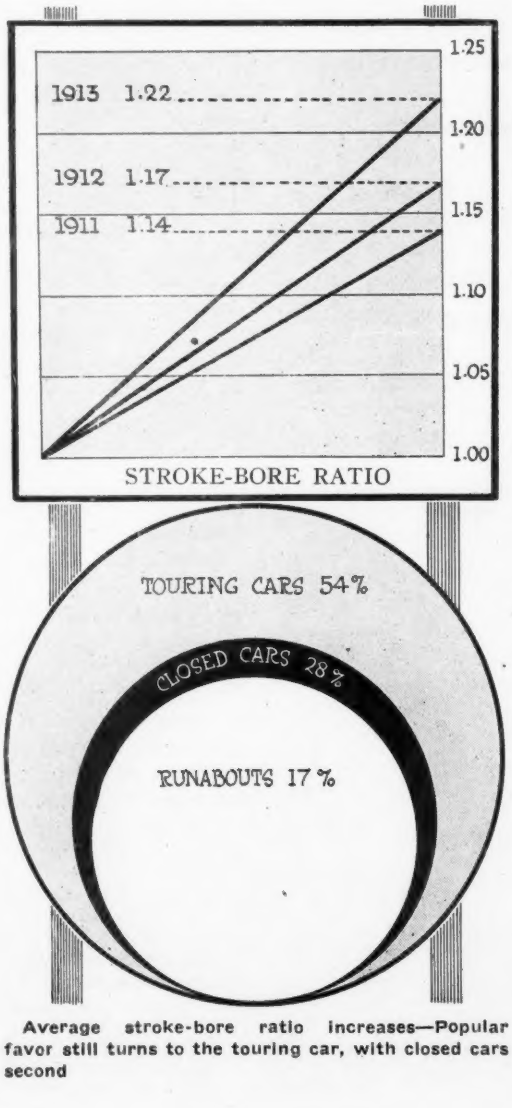
An Analysis of the 1913 Car

Survey of Entire American Automobile Industry Reveals Growth—Six-Cylinder Car Big Gainer—Horsepower Slightly Reduced and Stroke Lengthened—Engine Starters and Electric Lighting Are Features—Prices Are Higher

THE national automobile shows which open in Madison Square Garden and Grand Central Palace in this city on Saturday, January 11, will give the waiting public its first opportunity of viewing as a unit the 1913 models. In the Garden will be forty-three makes exhibited, in the Palace are forty-six, making a show total of eighty-nine. The buyer, in real earnest to survey the entire car field, can see ten other different makes along the Broadway salesrooms, thus having a field of 100 different makes to satiate his fastidious whims.

But though there is a round hundred laid at his feet, he then sees but a fraction of the enormous passenger car industry for there are sixty other makers of reputation who are neither at the shows nor represented along Broadway. Having the passenger vehicle shows held simultaneously in the two buildings for the first week and the commercial vehicle exhibits in the same arenas on the second week, with accessories present both weeks, affords a feast of showdom rarely if ever before afforded an American citizen.

Before in anywise endeavoring to analyze the broad field of automobile progress during the past year, look for a moment at what choice the purchaser has before him. The field is scarcely so broad as last year. At the start of 1912 there were 366 different chassis models to select from, and with the various bodies for each gave a possible field of 805 different body models. This year there are fewer chassis listed. To be exact, the number is 339, or a reduction of twenty-seven, due to the elimination of certain concerns by financial troubles followed by court action, and also to other concerns reducing the number of models they are marketing in order to cut down manufacturing cost and increase production. In the newcomer ranks are Edwards, Henderson and Touraine. Among those not now in existence, but familiar faces in the past are Elmore, Thomas,



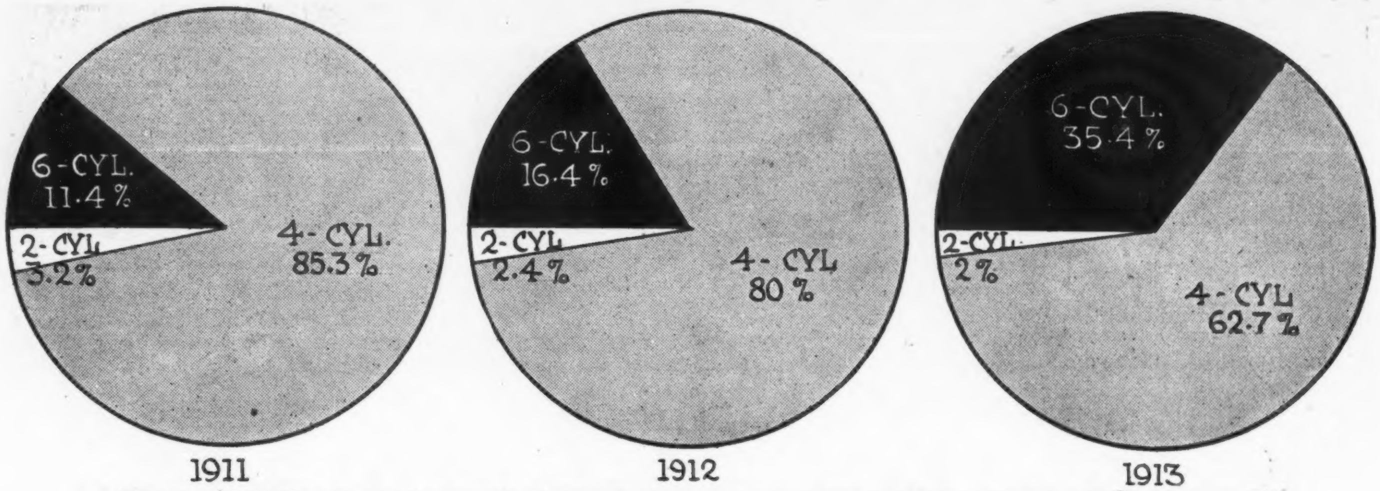
Average stroke-bore ratio increases—Popular favor still turns to the touring car, with closed cars second

Garden Cars

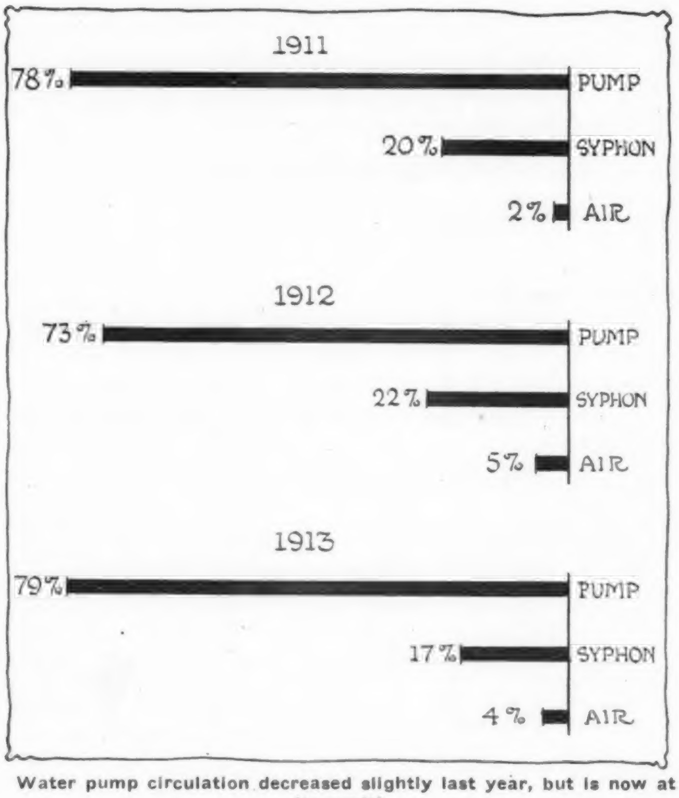
Alco	Jackson	Overland
Auburn	Knox	Packard
Buick	Locomobile	Peerless
Cadillac	Lozier	Pierce-Arrow
Cartercar	Matheson	Pope-Hartford
Chalmers	Maxwell	Premier
Columbia	Mercer	Pullman
Cunningham	Mitchell	Reo
Stoddard-Dayton	Moline	Selden
Flanders	Moon	S. G. V.
Franklin	National	Stearns
Garford	Marmon	Stevens-Duryea
Haynes	Oakland	White
Hudson	Oldsmobile	Winton

Palace Cars

Abbott-Detroit	Herreshoff	Pathfinder
American	Hupmobile	Norwalk
Bergdoll	Stutz	Only
Detroiter	Imperial	Paige
Buffalo	Inter-State	Paterson
Church-Field	Rambler	Case
Cole	Keeton	R.C.H.
Columbus	King	Regal
Cutting	Kisselkar	Republic
Davis	Kline	Speedwell
Edwards	Krit	Schacht
Empire	Lenox	Standard
Fiat	Marathon	Studebaker
Havers	Marion	Velie
Henderson	Metz	Westcott
	Michigan	



This chart tells the story of the growth of six-cylinder motors during 1911 and 1912 and the relative standing in 1913



Water pump circulation decreased slightly last year, but is now at its zenith

Marquette, Brush and a few others of less national reputation.

To the buyer who is interested in what he is going to get for the amount of money he has to spend, the question of price is paramount, and, in a nutshell, prices are higher than a year ago. Over half of the cars listed are higher priced than on January 1, 1912, due largely to more equipment in the way of engine starters, electric lights, tops, windshields, demountable rims, speedometers, anti-skid provisions, shock-absorbers and other equipment. The net result is more money's worth to the buyer, although his initial outlay is larger. The greater equipment is more noticeable among the cars listing at $2,500 and over, as generally those selling under this price were mostly sold with full equipment, the equipment being one of the inducements to the buyer.

The increase in price ranges from $50 to $500, but actual statistics, based on all of the listed models last year and those listed for this season, show the average price for 1912 at $2,508 and the average price for 1913 at $2,585, an increase of $77. This figure is based on the listed models and does not take the output into consideration. Were the average based on the actual cars sold it would be very much lower than this price mark.

But all have not raised the price. There are many examples of reduction, these ranging from $500 down. Where reductions are made they are largely attributed to reduced cost of production due to larger output, or to the reduction in the number of models, or to the redesigning of parts permitting of simpler manufacture and of using the parts in different models.

There are not a few cases where the prices of 1912 become the prices of 1913 and yet engine starters, electric lighting and more equipment are added. There are a few instances where the equipment has been added and the price cut from last year's figures.

Yet in spite of fewer models and higher prices, the buyer has a wide field to select from. If he desires a runabout there are 138 models listed to whet his appetite; if his tastes turn to five-passenger touring cars he has a selection field of 325; in the seven-passenger tourist field there are 100 models; the coupé division offers a latitude of 54; and in the limousines, landaulets and single-compartment vehicles there is a field of 174 to choose from. What more could be desired?

The following will be shown in their New York showrooms during the double exhibition: Apperson, Colby, Correja, Ford, G. J. G., Touraine, Palmer-Singer, Simplex, Staver and Warren.

Those that will not be seen in the show nor along Broadway include the following:

Ames, Amplex, Arbenz, Atlas, Austin, Burg, California, Cameron, Carhartt, Carroll, Chadwick, Cino, Coey, Corbitt, Crane, Crawford, Crow-Elkhart, Croxton, Day, Diamond T, Dispatch, Dorris, Duryea, Duquesne, Enger, Falcar, Great Eagle, Gleason, Glide, Great Southern, Great Western, Grout, Halladay, Holly, Indiana, Lambert, Lexington, Lion, Luverne, McFarlan, McIntyre, Mason, Motorette, Midland, Morse, Miller, Nyberg, Omaha, Pratt-Elkhart, Pilot, Perfex, Reeves, Richmond, Rayfield, Schlosser, Spaulding, Spoerer, Triumph and Zimmerman.

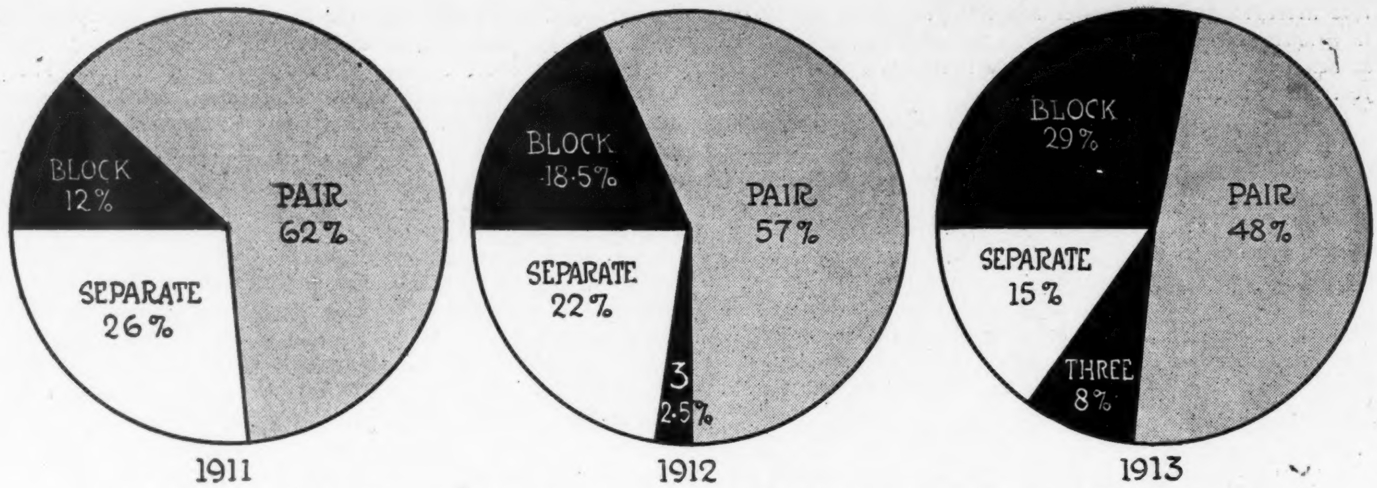
Coming to a consideration of the various chassis types for this year, and comparing them with previous years in order to note the direction of progress, many unmistakable currents of tendency are observed. Everybody is talking bore-stroke ratio, that is, the ratio of the piston stroke to the cylinder bore. In these days with a leaning towards long strokes this argument is perhaps more used by the salesman than any other. The bore-stroke ratio is 1.2 to 1, that is, on an average of all the American listed chassis the stroke exceeds the bore by 22 per cent. Last year the ratio was 1.16 to 1 and the year before 1.14 to 1.

Three Years of Stroke-Bore Ratio

1911, 1.14 to 1 1912, 1.16 to 1 1913, 1.22 to 1

These figures show an unmistakable movement, and while the stroke has been increasing, the bore has been diminishing. Figures covering these three years for motors with a stroke in excess of the bore, for motors with stroke equal to the bore, and for motors with a stroke less than the bore are:

	1911	1912	1913
Stroke greater than bore	219	306	314
Stroke equals bore	44	36	18
Stroke less than bore	17	24	7



The steady growth of block castings is one of the major characteristics of motor tendencies for the past two years

When reduced to percentage these figures show that in 1911 78.2 per cent. were of the longer-stroke type; in 1912 83.6 were of the longer-stroke type, and in 1913 93.1 are of the longer-stroke type. These figures are graphically charted on these pages.

Next of importance to stroke-bore ratio in motor design for this year is the strong leaning towards six-cylinder construction. There are not fewer than seventy-six concerns listing six-cylinder models, these companies having in all 120 different chassis models. Of this number there are thirty building nothing but sixes, some of them building one model, some two, and others three, four and five. Here are the names:

A. E. C.	3	Holly	1	Oldsmobile	2
Austin	3	Inter-State	1	Packard	5
Burg	2	Keeton	1	Palmer-Singer	2
Chadwick	2	Lexington	1	Pierce-Arrow	4
Chevrolet	1	Lozier	2	Premier	2
Coey	1	Luverne	1	Rayfield	1
Crane	1	Matheson	1	Speedwell	1
Flanders	2	McFarlan	3	Stevens-Duryea	2
Garford	2	McIntyre	2	Touraine	3
Havers	2	Norwalk	3	Winton	1

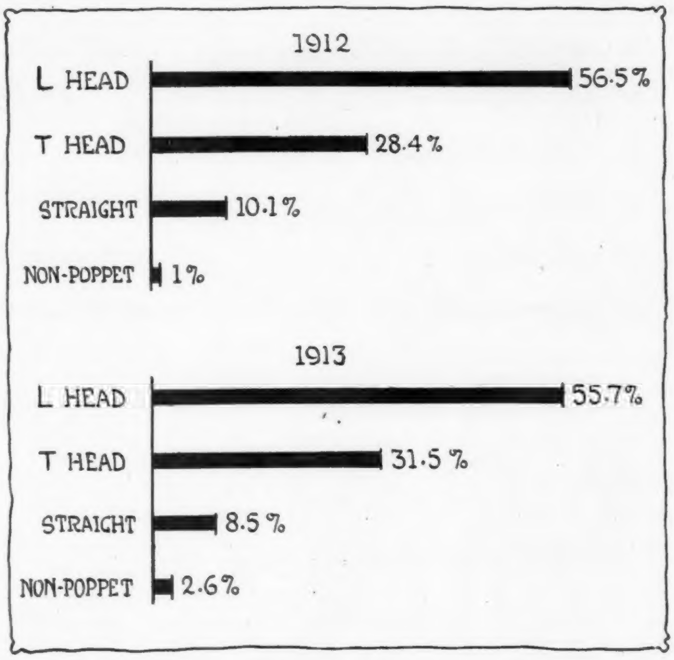
In this list are many new names which will be readily detected by those who are following the development of the art from year to year. Among these new six-cylinder faces are Stearns-Knight, Marmon, Stutz, Auburn, Moon, Norwalk, Touraine, Oakland, Speedwell, Studebaker, Staver, Warren, Westcott, Herreshoff, Hudson, Inter-State, Jackson, Cole, Colby, Chevrolet, McIntyre, Nyberg, Republic, Zimmerman, Croxton, Firestone-Columbus, Lenox, Lexington, Keeton, Holly, Duquesne, Crow-Elkhart, Correja, Crane, Burg, Alpena, Carroll, A. E. B., Luverne and Motza.

While these concerns have made their début into the field, the older concerns in the six-cylinder ranks have been adding to its numbers by introducing more models. For example, Packard, Locomobile, Lozier, Premier, Knox and others have added small sixes. There will be undoubtedly more of these additions announced before the show circuit is closed.

The growth of the six-cylinder field is largely an outcome of the public demand for sixes, which has been created by the able pioneering work done by a half dozen of our concerns which placed their entire confidence in six-cylinder types 3 and 4 years ago, and have been building them in many cases exclusively ever since. In this connection must be mentioned such concerns as Winton, Stevens-Duryea, Pierce-Arrow, Peerless, Franklin, Knox, etc.

The growth of the six-cylinder car during the last two seasons is well shown by the following figures, which show the number of two-cylinder, four-cylinder and six-cylinder chassis listed. Here they are, with percentages:

	1911	1912	1913
Six-cylinder chassis	32—11.4	60—16.4	120—35.4
Four-cylinder chassis	239—85.3	293—80	211—62.7
Two-cylinder chassis	9— 3.2	9— 2.4	7— 2



L-type cylinder casting is gradually losing ground and T-head type making slow gains

When viewed on a percentage basis, it will be seen how the six has gradually risen in regular steps from 11.4 per cent. in 1911 to 16.4 last year, and then with one broad leap to 35.4 this season. While this progress upward has been on hand, the percentage of four-cylinder models has gradually dropped in these three seasons, as the following figures show: 85.3 per cent., 80 per cent., 62 per cent.

The horsepower of the six-cylinder model in America averages higher than that for Europe, as might be expected, but there is a gradual reduction taking place from year to year, so that soon the American six-cylinder will be as low in horsepower as the foreign type, or nearly so. The poorer American roads and the heavier bodies call for additional horsepower, but with road improvements, increased motor efficiency and eliminating needless body weight, there is no reason why the next few years will not witness gradual steps downward in power.

Last year the average horsepower of the listed six-cylinder chassis was 45.77; this year it is 41.24, a reduction of 11 per cent. This is not all accounted for by longer stroke and reduced bore, because the piston displacement averages lower. Last year it was 474.4 cubic inches; this year it is 435.3. But yet with this reduction we are larger than the English six, which in

1912 averaged 34.7 horsepower and this year has risen to 36.8. In France, where the small motor is the giant of the day so far as activity is concerned, the average horsepower was 30.7 last year and it is cut to 26.6 this year.

In considering the style of casting used on four and six-cylinder motors, the T-head design is gaining. Last year its following numbered 28.4 per cent. of the total; this year it is 31.5, and during the same time L-head construction has fallen from 56.5 to 55.7. The valve-in-the-head type is diminishing. Last year thirty-seven models were listed; this year there are but twenty-nine. Last year saw four non-poppet models; this year there are nine, this increase being due to Stearns adding another Knight type, the Edwards company bringing out new Knight models, Speedwell adopting the Mead design, etc. The tabulation of cylinder types used and the percentage standing of each for this year and last is as follows:

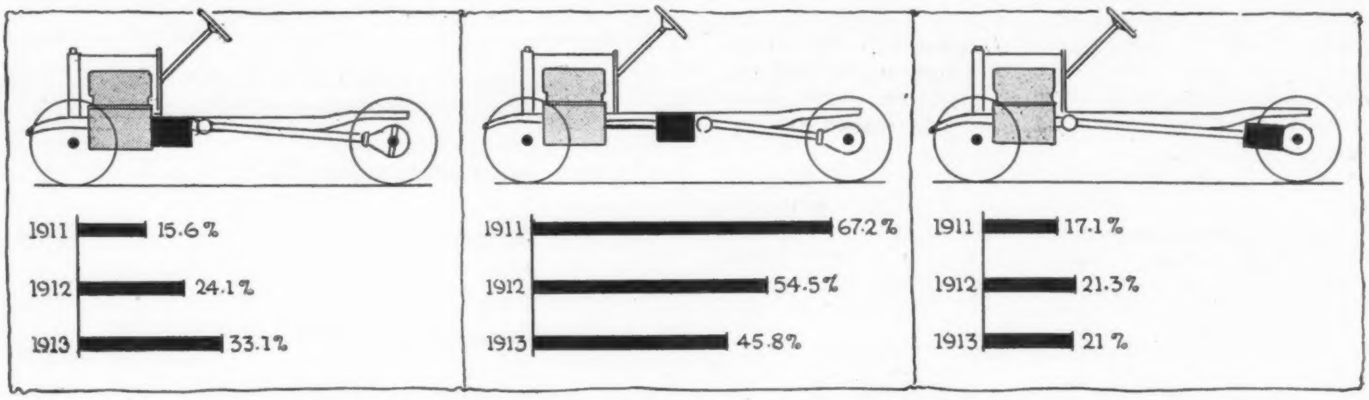
	1913 Per Cent.	1912 Per Cent.
T-head cylinder design	104—28.4	107—31.8
L-head cylinder design	207—56.5	189—55.7
Valve-in-head design	37—10.1	29— 8.5
Non-poppet design	4—1	9— 2.6

ferences in this respect. Fiat, for example, has a four-cylinder block with 557 cubic inches displacement, and a six with 556 cubic inches. These are the largest block types listed. The White six has 489.4 cubic inches displacement, the Staver six 452.4, the McFarlan the same, the Case measures 420.9. Others over the 400 mark are Only, 446.8; Pilot, 452.4; Cino, 452.4, and Westcott, 452.4.

The baby block is the new Studebaker, 154.8 cubic inches, with bore of 3.8 to 6.2 and stroke of 3.75 inches. Others in this low-capacity displacement class are Herreshoff, 161; Ford, 176; Krit, 176; Detroiter, 170; S. G. V., 193; R. C. H., 165.9; Paige, 170.7; Oakland, 192, and Metz, 176. The others range between the 200 and 400 marks.

Thermo-syphon cooling has dropped very considerably as compared with last year. In 1911 it was increasing, 1912 marked a gain and this year a slight drop. Here are the figures:

	1911	1912	1913
Water pump circulation	217—77.5	266—73	266—78.9
Thermo-syphon circulation	57—20.3	80—22	58—17.2
Air-cooling	6— 2.1	19— 5	13— 3.8



Mounting gearbox as unit with motor has gained 15 per cent. in last two years; mounting amidship has lost; and rear axle units remain stationary

Last year saw twelve different models of two-cycle engines listed, and for this year there are but five, due to the discontinuance of the Elmore and the Amplex being changed to four-cycle type.

With this trend in the matter of cylinder design there moves hand in hand the amazing landslide towards monobloc castings. This type of casting for four and six-cylinders has grown in leaps and bounds. There are sixteen concerns manufacturing six-cylinder block types of motors. They are: White, Fiat, Flanders, Garford, Studebaker, Warren, Inter-State, Herreshoff, Staver, McFarlan, McIntyre, Pilot, Keeton, Cino, Duquesne and N. E. C.

Statistics show that the block type of casting has grown from thirty-four in 1911 to sixty-seven in 1912 and to ninety-six this year. Here are the figures on the different methods of casting:

	1911	1912	1913
Cylinders cast in block	34	67	96
Cylinders cast in pairs	171	207	163
Cylinders cast in threes	...	9	27
Cylinders cast separately	72	82	51

When these figures are reduced to percentages, they show a steady reduction in the casting in pairs, the downward steps being 61.7 per cent., 56 per cent. and 48.3 per cent. There has been a steady reduction in casting separately as follows: 26 per cent., 22.4 per cent. and 15.1 per cent. The increase in block castings has been regular, namely, 12.2 per cent., 18.35 per cent. and 28.4 per cent. When block-motor castings were first introduced it was generally rumored that cylinder sizes would have to be kept especially low. Figures show, however, that there are wide dif-

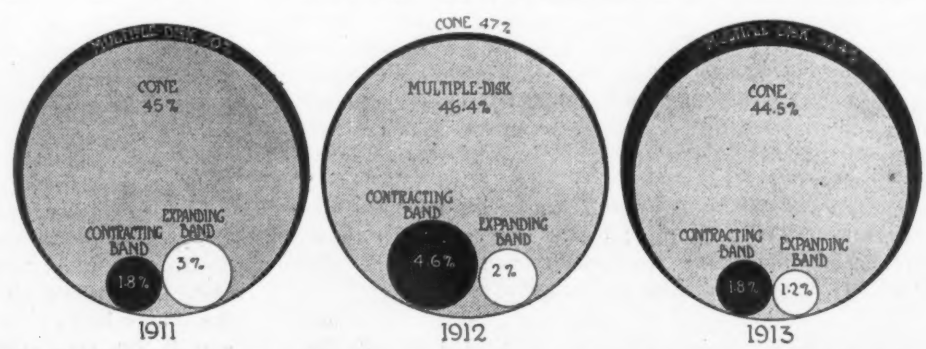
Dual ignition is still the popular hero, with a following of 234 models as compared with fifty-one using single ignition and fifty using double.

Much interest has been created of late in the method of mounting the gearbox so far as location is concerned. There are three divisions, those locating it as a unit with the motor, those mounting it as a separate unit, in the middle of the chassis, and those making it as a part of the rear axle. The rear-axle method is holding its own, mounting it as a unit with the motor is steadily increasing, and mounting it separately under the chassis is constantly falling off. The figures show:

	1911	1912	1913
Gearbox unit with motor	42—15.6	88—24.1	107—33.1
Gearbox separate amidships	181—67.2	199—54.5	148—45.8
Gearbox unit with rear axle	46—17.1	78—21.3	68—21

In these tables the actual number of models employing the different styles of gearset, as well as percentages of the total, are given. The trend is better shown by the per cent.

The four-speed gearbox is increasing in use; the three-speed



Multiple-disk clutches have gained in popularity and are now leading the pioneer cone type by a slight margin

set is holding its own; the two-speed set is decreasing; the friction set is decreasing. Statistics show as follows:

	1911	1912	1913
Four-speed gearset	50—17.8	66—18.2	76—22.4
Three-speed gearset	200—71.4	267—72.9	245—72.2
Two-speed gearset	18— 6.4	19— 5.1	9— 2.6
Friction transmission	12— 4.2	14— 3.8	9— 2.6

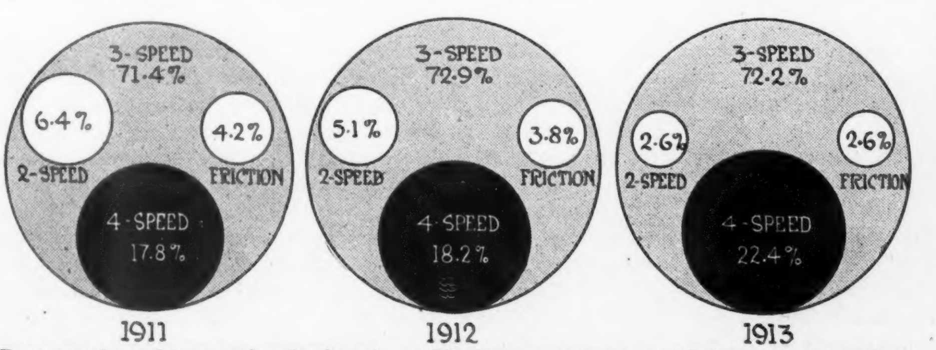
Space does not permit to go into detail in the question of clutches, which is a close contest between the multiple disk and the cone, with the disk a leader at 52 per cent. compared with 44 per cent. of the cone. Contracting band types and also expanding types have a following of less than 2 per cent. each.

It is all shaft drive when the question of final transmission is considered, so far as proportions are concerned, yet there are six companies listing worm reduction in the rear axle, three of which furnish it as an option. Those regularly listing worm drive are Edwards-Knight, Keeton and Holly. Firestone-Columbus, Pathfinder and Cino give it as an option.

The use of chain drive for camshafts, magneto shafts and pump shafts has grown. True, the growth has not been anything like what was anticipated, which, as one maker has put it, has been largely due to questions of manufacture. The American maker is favorable to fitting American-made chains for this work, and now that domestic products giving entire satisfaction are on the market it is certain that a rapid growth will be made. Thirteen companies fit silent chains, there being in all twenty-two models manufactured by these concerns. The companies and the number of models are:

Stearns, five; Velie, three; Kissel, four, and the following one each: Cadillac, Jackson, Oakland, Hupmobile, Edwards, Columbia, Stoddard-Dayton, Paige, Rayfield and Atlas.

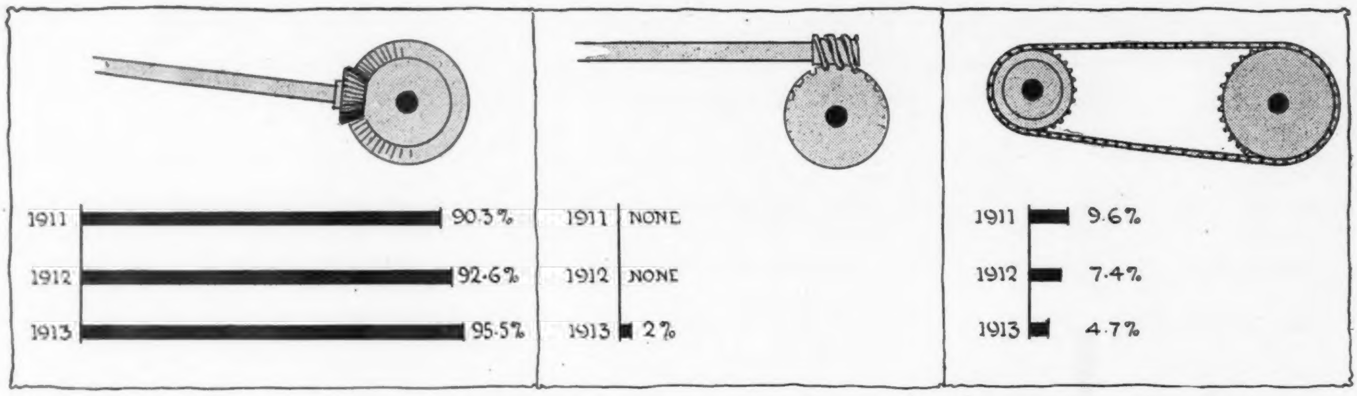
Fitting the steering column on the left side has made more than anticipated gains. At one time the feeling was that there would be a landslide towards this construction. The progress has been slower than looked for. Today eighty-five companies list left-hand control, 238 list right-hand control, twelve give an option, and four list center. It is easier to remember these in percentages: Right hand, 70; left hand, 25; optional, 3; center, 1.



Four-speed gearboxes make steady gains, while three-speed sets, which lead, remain stationary; friction sets decreasing

A wide change has come over the engine starter field within the last year in that the explosive gas type, which was a leader last season, is now in second place, and the premier position is held by the electric type, which controls 69 per cent. of the field. The explosive gas type is second with a following of 15 per cent., the air type is third with 11 per cent, and last comes the mechanical or spring type with 3 per cent following.

The advent of electric lights has greatly aided in the introduction of the electric starter, and from the avidity with which it has been taken it would seem that the public had been patiently waiting, and when the moment arrived received the electric type with open arms. The electric starter is present in a variety of forms, which for convenience may be designated single-unit systems and double-unit ones. There are types which act in unison with the electric lighting and also the ignition system, such an outfit really being a triple-service one. There are others in which one unit serves for starting and lighting; there are those where there is a single motor for starting; then, again, some systems are on the market in which two units are needed for starting, one a motor to crank the gasoline engine and the other a generator to charge the battery.



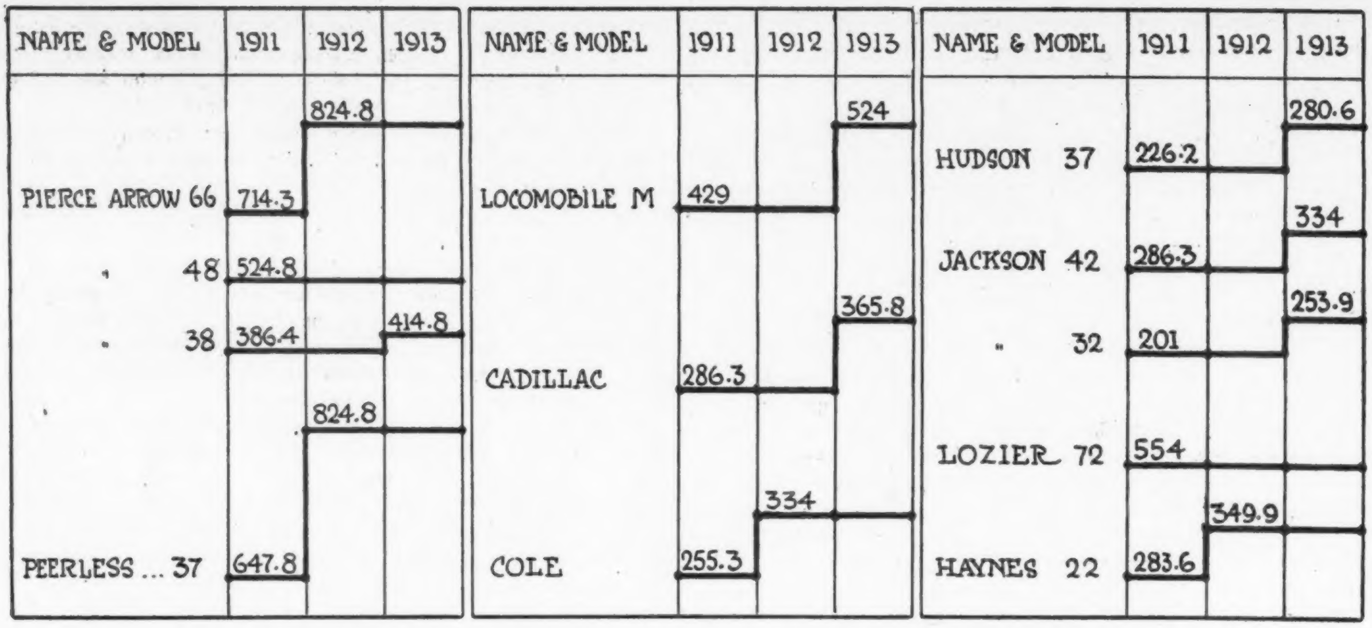
Bevel drive, which predominates the field, is gaining steadily; chain is losing slowly; worm makes its appearance

The flywheel type, that is the one in which the starting motor is incorporated in the flywheel, has made considerable progress. With this type as well as with others in which the motor or motor-generator are located alongside of the gasoline motor the one great aim is the reduction of weight and a keen business rivalry has developed on this line alone.

Many of the engine starters look the part of appurtenances, rather than forming an integral portion of the motor, a condition to be expected due to the rapid advent of the electric type, but which abuse, if it may be so termed, will be corrected before another year, so that the starting units will look as much a part of the gasoline motor as the carbureter or magneto.

Air starters have a good following. There has been a tendency, where they are used, to fit air pumps on the motor for generating the necessary air pressure, which has added to the expense to the extent of the pump, which is not mounted on the motor in every case, but often is grouped with the gearbox and driven from one of its shafts. Where air pumps are used they are more carefully made than last year.

The year has been an active one in the carbureter field, and while the vast majority of the carbureter business is carried on by carbureter concerns, rather than by car building companies, it is nevertheless a fact that car makers are vitally interested in it. As the carbureter field is covered at some length in other pages of this issue, it is unnecessary to comment at length at this



Showing changes made in the piston displacement in some models in the last 2 years

time further than to state that the movement towards multiple-jet construction is gradually developing and there has been wide effort to add easy-starting devices whereby gasoline can be by-passed direct from the float chamber to the manifold above the throttle in order to get the necessary richness. Added to such arrangements are hot water or air jackets and hot-air horns connecting with the exhaust manifold. Those using auxiliary air valves have added improvements to secure more ready and accurate adjustment and more steady action.

The strong movement towards placing the steering wheel on the left side of the car, which was begun a year ago, has shown a marked increase and while right-side control still is a big leader, the left-hand argument has a 25 per cent. following, leaving right-hand with 70 and the remaining 5 per cent. divided between those giving an option and those placing it in the center. By count of 339 chassis listed in the tabulations in other pages of this issue, 238 fit the steering wheel on the right-hand side, eighty-five place it on the left side, twelve give an option and four mount it in the center.

The one-time argument that only low and medium-priced cars would have the wheel mounted on the left is quite exploded by the fact that some of the highest-priced makers have placed the wheel on the left side on new and smaller models that they have recently added to their lines. In this respect attention is directed to the new Packard six, White six and fours, Lozier, Marmon, Premier, National, etc. Among the concerns listing left-side steering are: Maxwell, Michigan, Midland, Mitchell, Moon, Metz, National, Nyberg, Packard, Paige, Peerless, Premier, R. C. H., Reo, Republic, Schacht, Spaulding, Speedwell, Staver, Stoddard, Velie, White, Ames, Atlas, Austin, Chevrolet, Correja, Croxton, Cunningham, Day, Detroiter, Duquesne, Edwards, Firestone-Columbus, Ford, Garford, Glide, Great Southern, Henderson, Herreshoff, Holly, Inter-State, Keeton, King, Krit, Lenox, Lexington, Lion, Lozier, Luverne and Marmon. Of these some list all with left-side wheel, others with one, some with two and some with three models.

There is little new in frame construction, the conventional dropped frame being in the ascendency. The double-drop has gained in following but not to the extent that might be anticipated. The underslinging of springs, that is, clipping them under the axle instead of above the axle, has worked against the double-dropped frame in that it allows of a considerable lower body support, without the added expense of the double-dropped side members. The three-quarter elliptic spring has gained during the year, in spite of the fact that some of its old followers in Europe have discarded it and returned to the semi-elliptic type in order to eliminate side sway of the body.

More concerns than ever before are equipping their cars with shock-absorbers as stock. This suggests the more abundant equipment that nearly all of the cars are being listed with for this season. Concerns that heretofore scoffed at selling with equipment have gone through the entire gamut in adding such necessaries as top, windshield, speedometer, demountable rims, self-starter, etc., and often without adding to the price and in one case the price has been reduced. The movement of the full-equipped car of a few years ago has had a strong influence on the buyer and has virtually forced the higher-priced maker to deliver his car ready for the roads and any kind of weather.

There is no doubt that the question of prices of the 1913 models will at first present to the average layman the idea that there has been an increase in prices generally, due to the higher list prices than were quoted on 1912 models. This is not the case, however. An arbitrary comparison of the list prices of 2 years is no criterion to go by. The question resolves itself down to this: What did the equipment of the car consist of last year as compared with this? The problem of equipment has been taken care of, by including the equipment at an inclusive price. One of the prime movers, in the price increase, is traced to the self-starter and lighting dynamo. In other cases, the model, although of approximately the same rated horsepower in both years, may have an entirely new rear axle and many other improvements such as increased wheelbase or larger tires. It will be found that after adding what it would actually cost to include the extras, and then place the total alongside the price of the 1913 model, that the 1913 model is really cheaper.

There are other cases where the prices have actually been reduced. Where this practice prevails, it will invariably be found that large quantity production is the direct cause. This is true of the three Ford types, where a drop of $90 has been made in the case of the touring car, $100 on the town car and $65 on the runabout. The Overland 71 is another example in which there is an actual drop of $25. But this does not represent by any means the actual saving to the buyer. The new model includes top, windshield, speedometer, acetylene gas tank, tire irons and crankless starter, besides an elongation of the wheelbase. The Cole model 50 was marketed last year without equipment at $1,885, and when the equipment that is included in this year's models was added, the price was increased to $2,060. The price of this year's model is $1,985 showing a *prima-facie* saving

of $75. In addition to the equipment a stronger axle has been incorporated as well as a new radiator. The Delco lighting, starting and combined ignition system has also been added, which materially increases the price value of the car.

Due to an increased output, the Chalmers six-cylinder car has been reduced from $3,250 to $2,400 for the two, four and five-passenger cars and to $2,600 for the seven-seater. The other Chalmers model, while showing an actual increase in price from $1,900 to $1,950, has had a Gray & Davis lighting dynamo added, thereby virtually reducing the selling price.

Two further examples of actual price reduction are to be found in the Fiat and Packard models for next year. The Fiat company has made a clean-cut of $500 on the four-cylinder 35 and six-cylinder 50 models, besides including about $300 worth of equipment in the reduced price that was charged for extra last year. The reduction in price in this instance is due to the better and larger manufacturing facilities of the American factory. The Packard Company has reduced the price of the six-cylinder, 48-horsepower touring car from $5,000 to $4,850.

The accompanying table shows clearly that the majority of makers have a higher selling price this year than last. As has already been explained, this increase must not be regarded as such without further investigation into the cause. An excellent example of this is to be found in the 1913 Cadillac. Last year's model sold for $1,800 and the 1913 model is listed at $1,975, showing an increase of $175. Last year's model did not include a top, windshield or demountable rims which, when ordered extra as they usually are, would cost the purchaser $185, in itself alone more than the extra cost of the new 1913 model in which these extras are included. In addition the motor has been given 1.25 inches more bore, adding materially to the power, the wheelbase has been lengthened from 116 to 120 inches, the 4-inch tires have been increased to 4.5-inches, and a more expensive speedometer and a cocoanut mat have been added. It is only by analyzing the car in this manner that the buyer can form a correct idea and commensurate their values.

It would be manifestly unfair to compare the price of the last year's Hudson, for instance, with this year's model 37, the price of last year's being $1,600 against $1,870 this year. In the first place, the motor has been entirely changed, as well as several other structural features. Besides, a Delco starter and lighting outfit have been added including electric lights.

The tabulation given herewith has been compiled rather to show the tendency for next year than to attempt to set forth a complete list of the price changes that have been made. Consequently the figures cannot be taken as a means of striking a general average of increase in list price.

Quite a large number of the cars that list over $3,000 have remained at the same price, despite the fact that many have added equipment. Among those who have reduced their prices in this class may be mentioned the Haynes, Palmer-Singer and Premier. The Franklin prices have advanced $100, the extra price including an Entz self-starter and lighting system as well as a speedometer. The Kissel models have advanced $150, due to the addition of a self-starter and electric lighting system. The same remarks apply to the Matheson who have added a Westinghouse self-starter and electric lighting system, leaving the chassis materially the same as last year. The two larger models of the Pierce-Arrow have not been altered in price, while the smallest, namely, the six-cylinder 38 horsepower, has been increased by $300. This is due to the change in the size of the motor and the addition of an electric-lighting system and self-starter.

Both the White models that sell for more than $3,000, namely, the GE and GF, the latter being the six-cylinder, have not changed as far as price is concerned, but in addition to last year's equipment, an electric self-starter and lighting system have been incorporated besides the addition of a Klaxon horn.

In the $2,000-to-$3,000 class, the general advance seems to be between $100 to $200 to take care of the self-starters and electric lighting outfits that have been added. The National company has increased its list price on this account by $150. This also applies to the Haynes, Kissel, Marmon, Mercer. There are some, however, that have increased the price $250; but when the added equipment is taken into consideration, it is seen that there is no increase in price, without some compensating reason.

Table Showing Changes of Price on Some 1913 Models Giving the Amount of Increase or Decrease

CARS SELLING FOR $3000 AND UPWARDS

Make	Model	1912	1913	Increase or Decrease
Abbott-Detroit	Limousine	$3050	$3000	—$50
Alco	Touring	6000	6000	Same
American	Traveller	4250	4250	Same
Cadillac	Limousine	3250	3250	Same
Columbia	Touring	4500	4500	Same
Franklin D	Touring	3500	3600	+100
Franklin H	Touring	3750	3850	+100
Fiat	35	4500	4000	—500
Fiat	506-cylinder	5500	5000	—500
Haynes	Limousine	3800	3400	—400
Kissel	Touring	3000	3150	+150
Kline 6-60	Touring	3200	3500	+300
Locomobile	14 L	3500	3600	+100
Lozier 72	Touring	5000	5000	Same
Marmon 32	Limousine	4000	4000	Same
Marmon 32	Touring	3000	2750	—250
Matheson	Touring	4800	4800	Same
National	Touring	3250	3400	+150
Packard Six 48	Touring	5000	4850	—150
Palmer-Singer	Touring	3600	3200	—400
Peerless	All the same for both years			
Pierce-Arrow	6.38 Touring	4000	4300	+300
Pope-Hartford	33 Touring	3000	3250	+250
Premier	6.66	3750	4000	+250
S. G. V.	Limousine	3500	3500	Same
Simplex 127	Touring	5700	5700	Same
Stearns-Knight 4.40	Touring	3500	3750	+250
Stoddard-Dayton	Knight	5000	5000	Same
White GE	7-passenger	3500	3500	Same
Winton	Touring	3000	3000	Same

CARS COSTING FROM $2000 TO $3000

Make	Model	1912	1913	Increase or Decrease
Abbott-Detroit	Touring	$1800	$2000	+$200
American	Tourist	2250	2350	+100
Bergdoll	Touring	1900	2000	+100
Cadillac	Coupé	2250	2500	+250
Chalmers 5-seater	Six-Cylinder	3250	2400	—850
Chalmers 7-seater	Six-Cylinder	3250	2600	—650
Coey	Touring	1850	2000	+150
Cole, model 50	Touring	2060	1985	— 75
Franklin	M Touring	2800	2900	+100
Haynes 22	Touring	2100	2250	+150
Kissel 40	Touring	1850	2000	+150
Kissel 50	Touring	2350	2500	+150
Marmon	2-passenger	2750	2900	+150
Mercer	4-passenger	2750	2900	+150
National	5-passenger	3150	3300	+150
Pathfinder	Coupé	2250	2500	+250
Pratt	Touring	2100	2300	+200
Pullman 4.44	Touring	2150	2150	Same
Stoddard-Dayton	Touring	2800	2800	Same
Stutz	Roadster	2000	2000	Same
White	Touring	2250	2250	Same

CARS COSTING FROM $1250 TO $2000

Make	Model	1912	1913	Increase or Decrease
American	Scout	$1250	$1475	+$225
Ames	5-passenger	1600	1635	+ 35
Arbenz	Touring	1750	1875	+125
Bergdoll	Touring	1500	1600	+100
Buick 31	5-passenger	1250	1285	+ 35
Cadillac	Touring	1800	1975	+175
Carhartt	5-passenger	1350	1450	+100
Chalmers	40	1900	1950	+ 50
Franklin	Runabout	1650	1650	Same
Hudson	Touring	1600	1875	+275
Imperial 44	Touring	1750	1875	+125
King	Touring	1565	1500	+ 65
Jackson	Majestic	1650	1975	+325
Kissel	Roadster	1500	1700	+200
Marathon	Touring	1500	1350	—150
Marion	Touring	1285	1475	+190
Maxwell	Touring	1480	1675	+195
Mitchell 5.4	Touring	1350	1500	+150
Mitchell 5.6	Touring	1750	1850	+100
Moon	Touring	1600	1985	+385
Overland	71	1500	1475	— 25
Pathfinder	Touring	1750	1875	+125
Rambler	Cross Country	1650	1700	+ 50

CARS COSTING LESS THAN $1250

Make	Model	1912	1913	Increase or Decrease
Buick 24	Runabout	$900	$950	+$50
Buick 30	Roadster	1075	1125	+ 50
Ford	Touring	690	600	— 90
Ford	Town Car	900	800	—100
Ford	Runabout	590	525	— 65
Halladay	Touring	1100	1200	+100
Hupmobile	Runabout	750	750	Same
Krit	Touring	900	900	Same
Krit	Runabout	800	900	+100
Maxwell	Runabout	950	1110	+160
Maxwell	Touring	980	1145	+165
Metz	Runabout	495	495	Same
Overland 69	Touring	900	985	+ 85
R. C. H.	Runabout	750	900	+150
Reo the Fifth	5-passenger	1055	1095	+ 40

Stroke vs Bore

America - 1.22
France - - 1.65
Gt.Britain - 1.43

Installment I

¶ American motors show a tremendous majority of long stroke designs, 96.5 per cent. of all power plants being of this type. This article limits itself to a statistical review of this most important situation.

¶ In this installment American and French motors are dealt with, and a concluding installment to appear soon will contain a review of the British situation.

French Six-Cylinder Motors

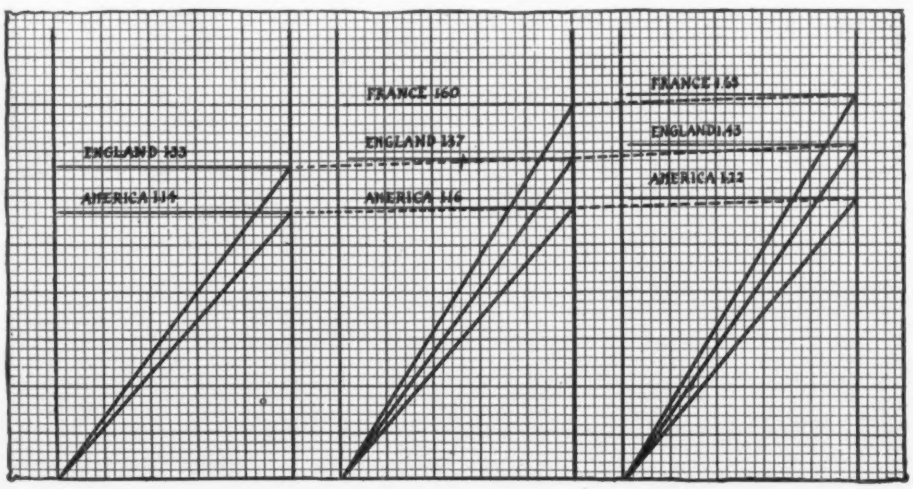
MOTOR	1912			1913		
	Bore	Stroke	Ratio	Bore	Stroke	Ratio
Aries	2.3	3.9	1.70	2.3	3.9	1.70
Aries	3.9	4.7	1.21	3.9	4.7	1.21
Bazelaire	2.9	4.3	1.48	2.9	4.7	1.62
Bollee, Leon	3.2	4.3	1.35	3.2	4.3	1.35
Brasier	3.5	5.5	1.57	3.5	5.5	1.57
Charron	3.1	4.7	1.52	3.1	4.7	1.52
Charron	3.7	5.1	1.38	3.7	5.1	1.38
Chenard & Walcker	3.1	5.9	1.91	3.1	5.9	1.91
Clement-Bayard	......	......	......	2.7	4.3	1.59
Clement-Bayard	3.1	4.7	1.52	3.1	4.7	1.52
Clement-Bayard	3.9	5.5	1.41	3.9	5.5	1.41
Delage	2.6	4.9	1.89	2.5	5.1	2.04
Delahaye	2.9	4.7	1.62	2.9	4.7	1.62
Delaunay-Belleville	2.8	4.7	1.68	2.8	4.7	1.68
Delaunay-Belleville	3.3	5.1	1.55	3.3	5.1	1.55
Delaunay-Belleville	3.9	5.5	1.41	3.9	5.5	1.41
Excelsior	3.3	5.1	1.55	3.3	5.1	1.55
F. L	3.1	3.9	1.26	3.1	3.9	1.26
Hotchkiss	3.7	5.1	1.38	3.7	5.1	1.38
Mors	......	......	......	3.3	5.9	1.79
La Buire	3.3	5.5	1.67	3.3	5.5	1.67
La Buire	3.5	5.5	1.57	3.5	5.5	1.57
Panhard-Levassor	3.9	5.5	1.41	3.9	5.5	1.41
Pilain	2.5	4.7	1.88	2.5	4.7	1.88
Renault	3.1	5.5	1.77	3.1	5.5	1.77
Renault	3.9	6.3	1.61	3.9	6.3	1.61
Roy	3.1	4.7	1.52	3.1	4.7	1.52
Schneider	2.9	4.7	1.62	2.9	5.1	1.76

OUT of 280 American motors for this year, 272 have strokes which are longer than the bores; four are square, with bores and strokes the same; and four have shorter strokes than bores. The average stroke-bore ratio is .22:1, as compared with 1.16:1 last year and 1.14:1 in 1911. The long bore-stroke ratio for 1913 varies from 1.02 to 1.85, the various ratios being distributed as shown in the tabulation further down in this column. The latter indicates that 159.3 per cent., have a ratio between 1.10 and 1.30:1.

Stroke-bore ratios of American motors

From 1.00:1 to 1.10:1	31
From 1.11:1 to 1.20:1	84
From 1.21:1 to 1.30:1	82
From 1.31:1 to 1.40:1	36
From 1.41:1 to 1.50:1	23
From 1.51:1 to 1.60:1	6
From 1.61:1 to 1.85:1	3
Square Motors (1:1)	10
Short-stroke (1:>1)	5

Before considering American long-stroke motors individually it is proposed to draw a parallel between the long-stroke tendency as evidenced in this country and on the other side of the Atlantic. The triple chart shown on the bottom of this page illustrates the average stroke-bore ratios as they have obtained during the past 3 years in the manufacture of automobiles in the United States and Great Britain, that of France being given only for the past 2 years, but being sufficient to illustrate



Average stroke-bore ratios of American, English and French automobile motors, illustrating the increase of the ratio during the past 3 years and showing the remarkable start established by French engineers in their productions

the trend in that country. These illustrations show that France is the leader of the long-stroke idea. While in 1912 the average stroke-bore ratio of French motors was 1.60:1, the ratio for 1913 is 1.65:1. The significance of this high figure is that while French engineers were among the first to realize the advantages of a long-stroke motor they have had no reason to change their opinion during the past 2 years; but, rather, the experiences obtained with early long-stroke motors have been of such a nature to induce them to further increase the ratio of the cylinder dimensions. If France was the pioneer in this movement, England was the first follower, perhaps due to the proximity of the two countries. England in 1911 produced motors with an average stroke-bore ratio of 1.33:1, in 1912 the ratio advanced to 1.37:1 and in 1913 to 1.43:1, perhaps on account of greater conservatism of the English engineers as compared with their French colleagues. The dotted lines on the chart illustrate the rate at which the stroke-bore ratio has been growing during the past years and if any conclusion may be drawn from this information, the tendency has rather gained and may be expected to gain still during the next few years.

To illustrate in detail the trend in American design THE AUTOMOBILE has compiled the accompanying tabulation giving bore, stroke and ratios for the past 3 years, but including only such motors as are still on the market. While this tabulation is not claimed to be absolutely complete, it is so within a very narrow margin, so that the averages from it are practically exact.

The greatest increase in stroke-bore ratio during 1912 was made by the Oakland 35 and the Westcott 50, both cars having a ratio exceeding their last year's by 43 per cent. The Oakland car, which had a square motor in 1912, has now a long-stroke type with a ratio of 1.43:1, and the Westcott had 1.05:1 stroke-bore ratio for 1912 and uses a ratio of 1.5:1 for this year. The leadership of these two makes in long-stroke progress illustrates in the best manner possible the alertness of manufacturers of medium-priced American cars. Directly after Oakland and Westcott comes the Mitchell 7-6 with a bore-stroke ratio of 1.65 which had a ratio of 1.11:1 in 1912. Next is the Auburn 33, formerly a square motor, but now having a stroke-bore ratio of 1.40:1. The Mitchell 5-4 is next with a ratio increase of 31 per cent., the 1913 ratio being 1.54:1 as against 1.18:1 in the 2 preceding years. The Staver 35, which had a ratio of 1.11:1 in 1912, is now 1.50:1, an increase of 35 per cent. Two cars show a ratio increase of exactly 30 per cent. These are the Moon 39, which had a ratio of 1.11:1 last year and

American Motor Dimensions and Ratios for Past 3 Years

MOTOR	1911			1912			1913		
	Bore	Stroke	Ratio	Bore	Stroke	Ratio	Bore	Stroke	Ratio
Abbott-Detroit D	4.00	4.50	1.12	4.13	4.25	1.03	4.13	5.25	1.27
Abbott-Detroit E	4.00	4.25	1.06	4.50	5.50	1.22	4.50	5.50	1.22
Adams-Farwell 9	....	....	....	5.50	5.00	.91	5.50	5.00	.91
A.E.C. 6-45	....	....	....	....	....	....	3.75	5.50	1.47
A.E.C. 6-60	....	....	....	....	....	....	4.25	5.00	1.18
Alco 7-16	....	....	....	....	....	....	3.94	4.25	1.08
Alco 11-60	4.75	5.50	1.16	4.75	5.50	1.16	4.75	5.50	1.16
Alpena N-50	4.00	4.50	1.12	4.13	5.25	1.27	3.75	5.25	1.40
American Scout 22A	....	....	....	3.75	4.50	1.20	3.75	5.00	1.33
American Tour. 34A	....	....	....	4.50	5.00	1.11	4.50	5.00	1.11
American Traveler 54A	5.38	5.50	1.02	5.38	5.50	1.02	5.38	5.50	1.02
Ames 44, 45	....	....	....	4.13	5.25	1.27	4.13	5.25	1.27
Apperson 4-45	4.50	5.00	1.11	4.50	5.00	1.11	4.50	5.00	1.11
Apperson 4-55	4.75	5.00	1.05	4.75	5.00	1.05	4.75	5.00	1.05
Arbenz F, G, H	4.13	5.25	1.27	4.13	5.25	1.27	4.13	5.50	1.33
Atlas 12	....	....	....	4.50	4.50	1.00	4.50	5.50	1.22
Auburn 33L	4.00	4.00	1.00	4.00	4.00	1.00	3.75	5.25	1.40
Auburn 37L	3.25	5.00	1.54	4.13	5.25	1.27	4.25	4.75	1.12
Auburn 40L	4.50	5.00	1.11	4.50	5.00	1.11	4.50	5.00	1.11
Auburn 6-50	....	....	....	4.13	5.25	1.27	4.13	5.25	1.27
Austin 55	....	....	....	4.38	5.25	1.20	4.00	5.00	1.25
Austin 66, 67	....	....	....	4.50	7.00	1.56	4.50	7.00	1.56
Bergdoll 30	4.00	4.50	1.12	4.00	4.50	1.12	4.00	4.50	1.12
Bergdoll 40	....	....	....	4.00	5.94	1.49	4.00	5.94	1.49
Buick 25, 24	3.75	3.75	1.00	3.75	3.75	1.00	3.75	3.75	1.00
Buick 31, 30	4.00	4.00	1.00	4.00	4.00	1.00	4.00	4.00	1.00
Buick 40	4.50	5.00	1.11	4.50	5.00	1.11	4.25	4.50	1.06
Burg S	....	....	....	....	....	....	3.75	5.25	1.40
Burg R	....	....	....	....	....	....	4.13	5.25	1.27
Cadillac 1913	4.50	4.50	1.00	4.50	4.50	1.00	4.50	5.75	1.27
Cameron 29A	3.88	3.75	.97	3.88	3.75	.97	3.88	3.75	.97
Carhartt K	4.06	4.50	1.11	4.06	4.50	1.11	4.06	4.50	1.11
Carhartt B	4.00	4.00	1.00	4.88	5.50	1.13	4.50	5.50	1.11
Carroll 6C	....	....	....	....	....	....	4.13	5.25	1.27
Carroll 4E	....	....	....	....	....	....	4.50	5.50	1.22
Carroll 4D	....	....	....	....	....	....	5.00	5.00	1.00
Cartercar 5	....	....	....	4.13	4.75	1.15	4.13	4.75	1.15
Case N	4.25	5.00	1.17	4.25	5.00	1.17	4.13	5.25	1.27
Case O	....	....	....	4.50	5.25	1.17	4.50	5.25	1.17
Chadwick 19	5.00	6.00	1.20	5.00	6.00	1.20	5.00	6.00	1.20
Chalmers 17	5.00	4.75	.95	4.25	5.25	1.23	4.25	5.25	1.23
Chevrolet C	....	....	....	....	....	....	3.55	5.00	1.41
Cino 440	4.38	5.00	1.14	4.38	5.00	1.14	4.50	5.00	1.11
Cino 660	....	....	....	4.00	5.00	1.25	4.00	6.00	1.50
Cino 950	....	....	....	....	....	....	4.50	6.00	1.33
Coey	....	....	....	4.00	5.00	1.25	4.00	5.00	1.25
Colby C	4.13	5.25	1.27	4.13	5.25	1.27	4.13	5.25	1.27
Colby E	4.25	5.25	1.23	4.25	5.25	1.23	4.50	5.50	1.22
Cole 40	....	....	....	....	....	....	4.13	4.75	1.15
Cole 50	4.25	4.50	1.06	4.50	5.25	1.17	4.50	5.25	1.17
Columbia	....	....	....	4.88	5.13	1.05	4.88	5.13	1.05
Corbitt D, E, F	....	....	....	....	....	....	4.00	4.50	1.12
Correja T & D	4.25	5.00	1.18	4.25	5.00	1.18	4.25	5.00	1.18
Correja C & J	....	....	....	....	....	....	3.50	5.00	1.43
Correja R & S	....	....	....	....	....	....	4.00	6.00	1.50
Crane 3	....	....	....	....	....	....	4.38	6.25	1.46
Crawford 13-30	4.25	4.50	1.06	4.13	4.75	1.15	4.13	5.25	1.27
Crawford 13-40	4.50	4.50	1.00	4.50	4.50	1.00	4.50	5.50	1.22
Crow-Elkhart C1	....	....	....	3.75	4.50	1.20	3.75	4.50	1.20
Crow-Elkhart C2, 3, 4, DT	....	....	....	4.00	4.50	1.12	4.00	4.50	1.12
Crow-Elkhart C5	....	....	....	4.13	4.75	1.15	4.13	5.00	1.21
Crow-Elkhart C6A	....	....	....	4.38	5.00	1.14	4.13	5.25	1.27
Crow-Elkhart C7, 8, 9	....	....	....	4.50	5.00	1.11	4.50	5.00	1.11
Crow-Elkhart C6B	....	....	....	....	....	....	3.75	5.00	1.33
Croxton A	....	....	....	....	....	....	4.13	5.50	1.33
Croxton B6	....	....	....	....	....	....	4.25	5.50	1.29
Cunningham M	4.75	5.75	1.21	4.75	5.75	1.21	4.75	5.75	1.21
Cutting 40	3.75	5.00	1.33	4.00	5.00	1.25	4.00	5.00	1.25
Davis 40	....	....	....	....	....	....	4.13	5.25	1.27
Davis 50	....	....	....	....	....	....	4.50	5.50	1.22
Day Utility D	....	....	....	4.00	4.50	1.12	4.00	4.50	1.12
Detroiter A	....	....	....	....	....	....	3.38	4.75	1.41
Diamond TP	....	....	....	....	....	....	5.00	5.50	1.10
Dispatch G2	....	....	....	3.50	5.00	1.43	3.50	5.00	1.43
Dorris H	4.38	5.00	1.14	4.38	5.00	1.14	4.38	5.00	1.14
Duquesne 50	....	....	....	....	....	....	4.75	5.50	1.16
Duquesne Six	....	....	....	....	....	....	3.75	5.50	1.47
Duryea	....	....	....	3.75	3.75	1.00	3.75	3.75	1.00
Edwards 25	....	....	....	....	....	....	4.00	5.50	1.37
Empire	3.50	4.00	1.15	3.50	4.00	1.15	3.50	4.50	1.28
Enger F, J, E	....	....	....	....	....	....	4.50	5.25	1.17
Falcar 40	....	....	....	....	....	....	4.13	5.25	1.27
Fiat 54	....	....	....	4.40	6.00	1.36	4.40	6.00	1.36
Fiat 55	....	....	....	....	....	....	5.13	6.75	1.32
Fiat 56	....	....	....	....	....	....	4.40	6.00	1.36
Firestone-C. 88E	4.25	4.50	1.06	4.13	5.25	1.27	4.13	5.25	1.27
Firestone 6C0	4.50	5.50	1.22	4.50	5.50	1.22	4.50	5.50	1.22
Flanders 40	3.63	3.75	1.03	3.63	3.75	1.03	3.63	4.50	1.24
Flanders 50	....	....	....	....	....	....	4.00	4.75	1.19
Ford T	3.75	4.00	1.07	3.75	4.00	1.07	3.75	4.00	1.07
Franklin G	4.00	4.00	1.00	4.00	4.00	1.00	4.00	4.00	1.00
Franklin M	....	....	....	3.63	4.00	1.10	3.63	4.00	1.10
Garford G15	....	....	....	4.25	5.25	1.23	3.75	6.00	1.60
Garford 14	4.25	5.25	1.24	4.25	5.25	1.24	4.25	5.25	1.24
G.J.G. Jr	....	....	....	3.75	4.50	1.20	3.75	4.50	1.20
G.J.G. Sr	4.75	5.00	1.05	4.75	5.00	1.05	4.75	5.00	1.05
Gleason R	....	....	....	....	....	....	4.75	4.00	.84
Glide 36-42	....	....	....	....	....	....	4.13	5.25	.127
Glide 45	4.75	5.00	1.05	4.75	5.00	1.05	4.75	5.00	1.05

Cylinder Sizes and Ratios of Bores and Strokes of American Four and Six-Cylinder Automobile Motors for 1911, 1912 and 1913

MOTOR	1911			1912			1913		
	Bore	Stroke	Ratio	Bore	Stroke	Ratio	Bore	Stroke	Ratio
Great Eagle C	....	....	....	4.13	5.25	1.27	4.13	5.25	1.11
Great Eagle B	....	....	....	....	....	....	4.75	5.00	1.05
Great Southern 30	....	....	....	4.00	4.50	1.12	4.00	4.50	1.12
Great Southern 51	....	....	....	5.13	6.00	1.17	5.19	6.00	1.15
Great Western	4.25	5.00	1.18	4.25	5.00	1.18	4.25	5.50	1.29
Grout 35	4.50	5.00	1.11	4.50	5.00	1.11	4.50	5.50	1.22
Grout 45	4.75	5.00	1.05	4.75	5.00	1.05	4.75	5.00	1.05
Halladay 32	4.00	4.00	1.00	3.75	5.25	1.40	3.75	5.25	1.40
Halladay 40	4.50	5.00	1.11	4.50	5.00	1.11	4.50	5.00	1.11
Havers 44	....	....	....	3.75	5.00	1.33	3.75	5.00	1.33
Havers 55	....	....	....	....	....	....	4.00	5.00	1.25
Haynes 22	4.50	5.50	1.22	4.50	5.50	1.22	4.50	5.50	1.22
Henderson	....	....	....	....	....	....	4.13	5.25	1.27
Herreshoff 4-30, 6-36	3.38	3.75	1.12	3.38	3.75	1.12	3.38	4.50	1.33
Holly A	....	....	....	....	....	....	4.00	5.00	1.25
Hudson 37	4.00	4.50	1.12	4.00	4.50	1.12	4.13	5.25	1.27
Hudson 54	....	....	....	....	....	....	4.13	5.50	1.27
Hupmobile C, E	3.25	3.38	1.04	3.25	3.38	1.04	3.25	3.38	1.04
Hupmobile H	....	....	....	3.25	5.50	1.05	3.25	5.50	1.05
Imperial 34	4.19	5.25	1.27	4.19	5.25	1.27	4.50	5.25	1.17
Imperial 44	4.38	4.50	1.03	4.50	5.25	1.17	4.75	5.25	1.10
Interstate 45	4.50	5.00	1.11	4.50	5.00	1.11	4.00	5.00	1.25
Jackson Olympic	4.50	4.50	1.00	4.50	4.50	1.00	4.13	4.75	1.15
Jackson Majestic	4.75	4.75	1.00	4.75	4.75	1.00	4.50	5.25	1.17
Keeton 48	....	....	....	....	....	....	3.75	5.50	1.47
King	3.81	5.13	1.34	3.81	5.13	1.34	3.81	5.13	1.34
King	....	....	....	....	....	....	4.00	5.50	1.37
Kisselkar 30	4.25	4.25	1.00	4.25	4.25	1.00	4.25	4.25	1.00
Kisselkar 40	4.50	4.75	1.05	4.50	4.75	1.05	4.50	5.25	1.17
Kisselkar 50	4.88	5.00	1.03	4.88	5.00	1.03	4.88	5.00	1.03
Kisselkar 60	4.88	4.75	.98	4.50	4.75	1.05	4.50	5.25	1.17
Klinekar 30	4.00	4.50	1.12	4.00	4.63	1.15	4.00	4.63	1.15
Klinekar 40	4.25	5.25	1.23	4.25	5.50	1.29	4.25	5.50	1.29
Klinekar 50	4.10	5.00	1.22	4.10	5.00	1.22	4.10	5.00	1.22
Knox 46	5.00	4.25	.95	5.00	4.25	.95	4.38	5.50	1.20
Knox 44	....	....	....	5.00	5.50	1.10	5.00	5.50	1.10
Krit K	3.38	4.00	1.06	3.38	4.00	1.06	3.70	4.00	1.08
Lambert 40	4.13	5.50	1.33	4.13	5.50	1.33	3.25	5.25	1.62
Lambert 99	4.50	5.00	1.11	4.50	5.00	1.11	4.25	5.25	1.23
Lenox Four	4.25	5.50	1.29	4.25	5.50	1.29	4.25	5.50	1.29
Lenox Six	....	....	....	....	....	....	4.00	5.00	1.25
Lexington 13	4.75	5.00	1.05	4.38	5.50	1.33	4.13	5.25	1.27
Lion 30	4.50	5.00	1.11	4.50	5.00	1.11	3.50	5.00	1.43
Little Four A	....	....	....	....	....	....	3.50	3.38	.97
Locomobile L	4.50	4.50	1.00	4.50	4.50	1.00	4.50	4.50	1.00
Locomobile R	....	....	....	....	....	....	4.25	5.00	1.18
Locomobile M	....	....	....	....	....	....	4.50	5.50	1.22
Lozier 72	4.63	5.50	1.19	4.63	5.50	1.19	4.63	5.50	1.19
Lozier 77	....	....	....	....	....	....	3.63	5.50	1.51
Luverne 760	....	....	....	4.75	5.00	1.05	4.25	5.25	1.23
Marathon Run	3.25	3.50	1.08	3.25	3.50	1.08	3.50	4.50	1.28
Marathon Win	4.25	4.50	1.06	4.25	4.50	1.06	4.25	4.50	1.06
Marathon Champ	....	....	....	4.50	5.13	1.14	4.50	5.13	1.14
Marion 36A, 37A	....	....	....	4.00	5.00	1.25	4.00	5.00	1.25
Marion 48A	4.25	4.50	1.06	4.13	5.50	1.33	4.13	5.50	1.33
Marmon 32	4.50	5.00	1.11	4.50	5.00	1.11	4.50	5.00	1.11
Marmon Six	....	....	....	....	....	....	4.50	6.00	1.33
Mason A, B, C	4.50	5.00	1.11	4.50	5.00	1.11	5.00	5.00	1.00
Mason K	....	....	....	....	....	....	4.00	4.50	1.12
Matheson C	....	....	....	4.50	5.00	1.11	4.50	5.00	1.11
Maxwell 4	4.50	4.00	.89	4.50	4.00	.89	3.75	4.00	1.07
Maxwell 8	4.25	4.25	1.00	4.25	4.25	1.00	4.00	4.63	1.16
Maxwell 10	....	....	....	4.25	5.25	1.23	4.25	5.25	1.23
McFarlan S	4.00	5.00	1.25	4.00	5.00	1.25	4.00	5.00	1.25
McFarlan M	3.63	4.00	1.10	4.25	5.00	1.18	4.25	5.00	1.18
McFarlan T	....	....	....	....	....	....	4.00	6.00	1.05
McIntyre G	....	....	....	4.00	5.00	1.25	3.50	4.50	1.27
Mercer J & K	4.38	5.00	1.14	4.38	5.00	1.14	4.38	5.00	1.14
Mercer G & H	4.25	4.50	1.06	4.50	5.00	1.11	4.50	5.00	1.11
Metz 22	....	....	....	3.75	4.00	1.07	3.75	4.00	1.07
Michigan L & O	....	....	....	....	....	....	4.06	4.50	1.11
Michigan R & S	....	....	....	....	....	....	4.25	5.25	1.23
Midland T4	4.50	5.00	1.11	4.50	5.00	1.11	4.50	5.00	1.11
Midland T6	4.75	5.50	1.16	4.36	5.00	1.14	4.00	5.00	1.25
Miller 40	....	....	....	....	....	....	4.13	5.15	1.24
Mitchell 5-4	4.25	5.00	1.18	4.25	5.00	1.18	4.25	7.00	1.54
Mitchell 5-6	3.75	5.50	1.46	3.75	5.50	1.46	3.75	6.00	1.60
Mitchell 7-6	4.50	5.00	1.11	4.50	5.00	1.11	4.25	7.00	1.65
Moline M40	4.00	6.00	1.50	4.00	6.00	1.50	4.13	6.00	1.45
Moon 39	4.50	5.00	1.11	4.50	5.00	1.11	4.00	5.75	1.44
Moon 48	4.75	5.00	1.05	4.75	5.00	1.05	4.50	5.00	1.11
Moon 65	....	....	....	....	....	....	4.00	5.75	1.44
Morse	4.63	5.00	1.08	4.63	5.00	1.08	4.63	5.00	1.08
Motorette L, M & R	....	....	....	3.25	3.75	1.16	3.75	3.75	1.00
Moyer D & F	....	....	....	....	....	....	4.00	5.00	1.25
Moyer B & E	....	....	....	....	....	....	4.50	5.00	1.11
National Series V	....	....	....	4.88	6.00	1.23	4.88	6.00	1.23
Norwalk A	....	....	....	....	....	....	4.00	5.00	1.25
Norwalk B	....	....	....	....	....	....	4.50	5.50	1.22
Nyberg 437	....	....	....	....	....	....	3.75	5.25	1.40
Nyberg 440	....	....	....	....	....	....	4.25	5.25	1.23
Nyberg 64SR	....	....	....	....	....	....	4.25	5.00	1.17

the year before and which now is 1.44:1. The other motor is the Garford G 15; last year its stroke was only 23 per cent. longer than the bore, but for 1913 the ratio has been increased to 1.60, which gives the motor one of the highest ratios used in American practice today. An increase of 28 per cent. has taken place in the case of the Knox 46, which has been changed from a short-stroke to a long-stroke design during the year 1912. Instead of .95:1 the motor is now 1.20:1. A stroke-bore ratio increase of 27 per cent. is the record of the Cadillac, which was a square motor, but which now has a ratio of 1.27:1. The Speedwell car has undergone the same change.

An examination of the tabulation brings out many other increases ranging from 25 per cent. down to 10 and less. Among the motors included in this group are the White GEB and White GF, the Maxwell 4, Crawford, Crow-Elkhart, Flanders 40, Atlas 12, Lambert 40, and many others.

On the other hand a few companies have reduced the stroke-bore ratios of their product, and the most notable instance in this group is the Oldsmobile, which has now a ratio of 1.15:1 as compared with last year's of 1.50:1. The decrease in this case is equivalent to 23 per cent. The Motorette is now a square design, while last year it had a ratio of 1.16:1. The Auburn 37 has continued its development toward a low stroke-bore ratio by using the proportion 1.12:1 this year, after the 1912 ratio of 1.27:1, which in turn was considerably below that of the preceding year, namely, 1.54:1. Mason, Krit and Imperial are other examples of the same practice.

Coming to the stroke-bore ratios themselves, the highest value in this respect is that by the Only car, which continues its ratio of 1.85:1 from last year. The second greatest ratio is that of the Mitchell 7-6, namely, 1.65:1. The Lambert cars with a ratio of 1.62:1 is next, being followed by the Mitchell 5-6 and the Garford G15, both of which have strokes 60 per cent. greater than their respective bores.

The stroke-bore ratio which ranks next after these is 1.56:1, in the Austin 66 and 67. Then follow several motors with the ratio of 1.54:1, as the R. C. H. and the Mitchell 5-4. Five makes of cars use motors with a stroke-bore ratio of 1.50:1; these are the Cino 560, the Correja R and S, Pilot 60, Staver 65 and Westcott 50. The motors with ratios between 1.40 and 1.50:1 number about a score, while the majority of cars use ratios from 1.10 to 1.33:1.

The tabulations of French bores, strokes and ratios appearing on pages 72 and 76 afford an opportunity to compare the continental practice to that current in America. Out of 229 motors listed in this tabulation all but forty have

stroke-bore ratios of more than 1.30:1 and of these forty twenty-seven ratios are higher than 1.20:1 Not a single short-stroke motor appears in the table, the minimum ratio being 1.07:1, this being the Germain motor. A Sizaire-Naudin motor with a ratio of 2.48:1 represents the most advanced step of the French designer in the direction of the long stroke. Next to it ranks the Gobron motor, which has a ratio of 2.19:1, the La Buire with a ratio of 2.18:1 and the Rossel, 2.12:1. There are fully thirteen motors with a ratio of 2.04:1, bringing the number of power plants in which the stroke is more than twice the bore beyond a score. Remembering that the American Only car with a ratio of 1.85 stands practically in a class by itself and that the next ratio is 1.65:1, it appears that the French school of automobile engineering, which has this year produced dozens of motors with ratios higher than 1.65:1, is far ahead of American practice in this point of design. The reason is probably that the advantages of long-stroke motors were reasoned out theoretically some time before practice verified the assumptions of their designers, and the French being so much greater theorists than Americans, gained an appreciable advantage over the latter, due to their energetic start in this contest of designs. The practical effect of this development is that the French average ratio of 1.65:1 is 35 per cent. higher than the American average of 1.22:1 and on a level with the ratio 1.65, which in a way may be considered as the American high-water mark in stroke-bore ratios.

Of the 229 French motors here tabulated, 201 are four-cylinder types and twenty-eight six-cylinder designs. The average stroke-bore ratio of the four-cylinder motors is 1.64:1 and that of the six-cylinder power plants 1.80, which is responsible for the general average being slightly higher than that of the four-cylinder motors.

The list of English cars for 1913 is much smaller in number than either that of American or French products, but nevertheless the progressive spirit of British designers has created in 1913 product with an average ratio, as mentioned above, of 1.43:1. In an early issue of THE AUTOMOBILE a list of English motors giving their bores, strokes and ratios will be published.

One of the chief differences between French and British designers is the favoring attitude of the latter toward six-cylinder designs. In France, twenty-eight out of 201 motors are six-cylinder types, or 12.2 per cent., as compared with 18.6 per cent. of the 113 English motors. The list of English motors not being published this week, only specific instances will be cited at present.

Cylinder Sizes and Ratios of Bores and Strokes of American Four and Six-Cylinder Automobile Motors for 1911, 1912, 1913

MOTOR	1911			1912			1913		
	Bore	Stroke	Ratio	Bore	Stroke	Ratio	Bore	Stroke	Ratio
Oakland 35	4.00	4.00	1.00	4.00	4.00	1.00	3.50	5.00	1.43
Oakland 42, 6-60	4.50	5.00	1.11	4.50	5.25	1.16	4.13	4.75	1.15
Oldsmobile 53	....	....	....	4.00	6.00	1.50	4.13	4.75	1.15
Omaha 30	....	....	....	....	....	....	4.06	4.50	1.11
Only A	5.13	10.00	1.95	4.25	7.88	1.85	4.25	7.88	1.85
Overland 69	4.00	4.50	1.12	4.00	4.50	1.12	4.00	4.50	1.12
Overland 71	4.25	4.50	1.06	4.38	4.50	1.03	4.38	4.50	1.03
Pacific Special A & B	....	....	....	....	....	....	4.50	5.00	1.11
Packard 38	4.06	5.13	1.26	4.06	5.13	1.26	4.00	5.50	1.37
Packard 48	....	....	....	4.50	5.50	1.22	4.50	5.50	1.22
Paige 25	3.75	4.00	1.07	3.75	4.00	1.07	3.75	4.00	1.07
Paige 36	....	....	....	....	....	....	4.00	5.00	1.25
Palmer-Singer Brighton	4.00	4.75	1.18	4.00	5.00	1.25	4.00	5.00	1.25
Palmer-Singer LXIV	4.88	5.50	1.13	4.88	5.50	1.13	4.88	5.50	1.13
Paterson 43	4.00	4.00	1.00	4.00	4.00	1.00	4.13	4.75	1.15
Paterson 47	3.63	3.63	1.01	4.50	5.25	1.17	4.50	5.25	1.17
Pathfinder	4.13	5.25	1.27	4.13	5.25	1.27	4.13	5.25	1.27
Peerless 29	4.00	4.63	1.16	4.00	4.63	1.16	4.00	4.63	1.16
Peerless 35	....	....	....	4.00	5.50	1.37	4.00	5.50	1.37
Peerless 36	....	....	....	4.50	6.00	1.33	4.50	6.00	1.33
Peerless 37	....	....	....	5.00	7.00	1.40	5.00	7.00	1.40
Perfex 2	....	....	....	....	....	....	3.75	4.50	1.20
Pierce-A, 38C	4.00	5.13	1.28	4.00	5.13	1.28	4.00	5.50	1.37
Pierce-A, 48D	....	....	....	4.50	5.50	1.22	4.50	5.50	1.22
Pierce-A, 66A	5.00	7.00	1.40	5.00	7.00	1.40	5.00	7.00	1.40
Pilot 50	4.50	5.00	1.11	4.50	5.00	1.11	4.50	6.00	1.33
Pilot 60	....	....	....	....	....	....	4.00	6.00	1.50
Pope-Hartford 33	4.75	5.50	1.16	4.75	5.50	1.16	4.75	5.50	1.16
Pope-Hartford 29	....	....	....	4.19	5.38	1.28	4.32	5.38	1.24
Pope-Hartford 31	....	....	....	....	....	....	4.32	5.13	1.19
Pratt 30	....	....	....	....	....	....	4.00	4.50	1.12
Pratt 40	4.50	4.75	1.05	4.50	4.75	1.05	4.50	4.75	1.05
Pratt 50	....	....	....	....	....	....	4.50	5.75	1.28
Premier 6-40	4.50	5.25	1.17	4.50	5.25	1.17	4.00	5.00	1.25
Premier 6-60	4.50	5.25	1.17	4.50	5.25	1.17	4.50	5.25	1.17
Pullman 36	4.06	5.00	1.23	4.06	5.00	1.23	4.06	5.00	1.23
Pullman 44, 66	....	....	....	4.50	5.50	1.22	4.50	5.50	1.22
Rambler Cr. C	....	....	....	4.50	4.50	1.00	4.50	4.50	1.00
Rayfield C	3.56	5.00	1.40	3.56	5.00	1.40	3.50	5.50	1.47
R-C-H	....	....	....	3.25	5.00	1.54	3.25	5.00	1.54
Reeves Sexto Auto	....	....	....	....	....	....	4.75	5.50	1.16
Regal T & N	....	....	....	4.13	4.00	.97	3.75	4.50	1.20
Regal H	4.25	4.50	1.06	4.25	4.50	1.06	4.25	4.50	1.06
Regal C	4.00	4.50	1.12	4.00	4.50	1.12	4.00	5.00	1.25
Reo V	4.00	4.50	1.12	4.00	4.50	1.12	4.00	4.50	1.12
Republic E, D	4.25	5.00	1.18	4.25	5.00	1.18	4.25	5.00	1.18
Richmond O	....	....	....	4.00	4.50	1.12	4.00	4.50	1.12
Richmond P	4.50	5.00	1.11	4.50	5.00	1.11	4.50	5.00	1.11
Schacht NS, KO	4.00	4.25	1.06	4.32	5.00	1.16	4.25	5.50	1.29
Schlosser	....	....	....	5.00	6.00	1.20	5.00	6.00	1.20
Selden 48	....	....	....	4.75	5.00	1.05	4.75	5.00	1.05
S.G.V.A	3.75	4.38	1.17	3.75	4.38	1.17	3.75	4.38	1.17
S.G.V.D	4.00	5.25	1.31	4.00	5.25	1.31	4.00	5.25	1.31
Simplex 127	4.88	6.50	1.33	4.88	6.50	1.33	4.88	6.50	1.33
Simplex 129	....	....	....	5.75	5.75	1.00	5.75	5.75	1.00
Spaulding G	....	....	....	4.13	5.25	1.27	4.25	5.50	1.29
Speedwell G	4.00	4.50	1.12	5.00	5.00	1.00	4.13	5.25	1.27
Spoerer 40-C	....	....	....	4.88	5.50	1.18	4.88	5.50	1.18
Spoerer 25-A	....	....	....	4.13	5.50	1.33	4.13	5.50	1.33
Staver 45	4.50	5.00	1.11	4.50	5.00	1.11	4.50	5.00	1.11
Staver 55	4.50	5.00	1.11	4.50	5.00	1.11	4.50	6.00	1.33
Staver 65	....	....	....	4.50	5.00	1.11	4.00	6.00	1.50
Stearns-Knight 4	4.25	5.50	1.29	4.25	5.50	1.29	4.25	5.50	1.29
Stearns-Knight 6	....	....	....	....	....	....	4.25	5.75	1.35
Stevens Duryea C	....	....	....	4.25	4.75	1.12	4.32	5.50	1.27
Stoddard-Dayton 30	4.00	4.50	1.12	4.00	4.50	1.12	4.00	4.50	1.12
Stoddard-Dayton 38	4.25	5.13	1.21	4.25	5.13	1.21	4.25	5.13	1.21
Stoddard-Dayton 48	4.75	5.00	1.05	4.75	5.00	1.05	4.75	5.00	1.05
Stoddard-Dayton Knight	4.50	5.50	1.22	4.50	5.50	1.22	4.50	5.50	1.22
Studebaker 20	3.75	3.63	.97	3.63	3.75	1.03	3.63	3.75	1.03
Studebaker 25, Six	....	....	....	....	....	....	3.50	5.00	1.43
Studebaker 30	4.00	5.50	1.37	4.00	4.50	1.12	4.00	4.50	1.12
Studebaker 35	....	....	....	....	....	....	4.13	5.00	1.21
Stutz Four	....	....	....	4.75	5.50	1.16	4.75	5.50	1.16
Stutz Six	....	....	....	....	....	....	4.25	5.00	1.18
Touraine 7, 6	....	....	....	....	....	....	4.00	5.25	1.31
Triumph A, B	....	....	....	....	....	....	4.75	5.50	1.16
Velie 32	....	....	....	....	....	....	.75	5.50	1.47
Velie 40	....	....	....	4.50	5.25	1.17	4.50	5.25	1.17
Warren Wolverine	4.00	4.50	1.12	4.13	4.50	1.09	4.13	4.50	1.09
Warren Resolute	....	....	....	4.25	4.75	1.12	4.00	5.00	1.25
Warren Pilgrim	....	....	....	....	....	....	4.25	4.75	1.10
Westcott 40	....	....	....	4.50	5.00	1.11	4.50	5.00	1.11
Westcott 50	4.75	5.00	1.05	4.75	5.00	1.05	4.00	6.00	1.50
White GRE	....	....	....	3.75	5.13	1.37	3.75	5.13	1.37
White GEB, GF	....	....	....	4.75	5.13	1.08	4.25	5.75	1.35
Winton 17D	4.50	5.00	1.11	4.50	5.00	1.11	4.50	5.00	1.11
Zimmerman Z6	....	....	....	....	....	....	3.75	5.00	1.33
Zimmerman Z40	....	....	....	4.32	5.00	1.16	4.32	5.00	1.16
		1.14			1.17			1.22	

Cylinder Bores, Strokes and Ratios of French Four-Cylinder Motors

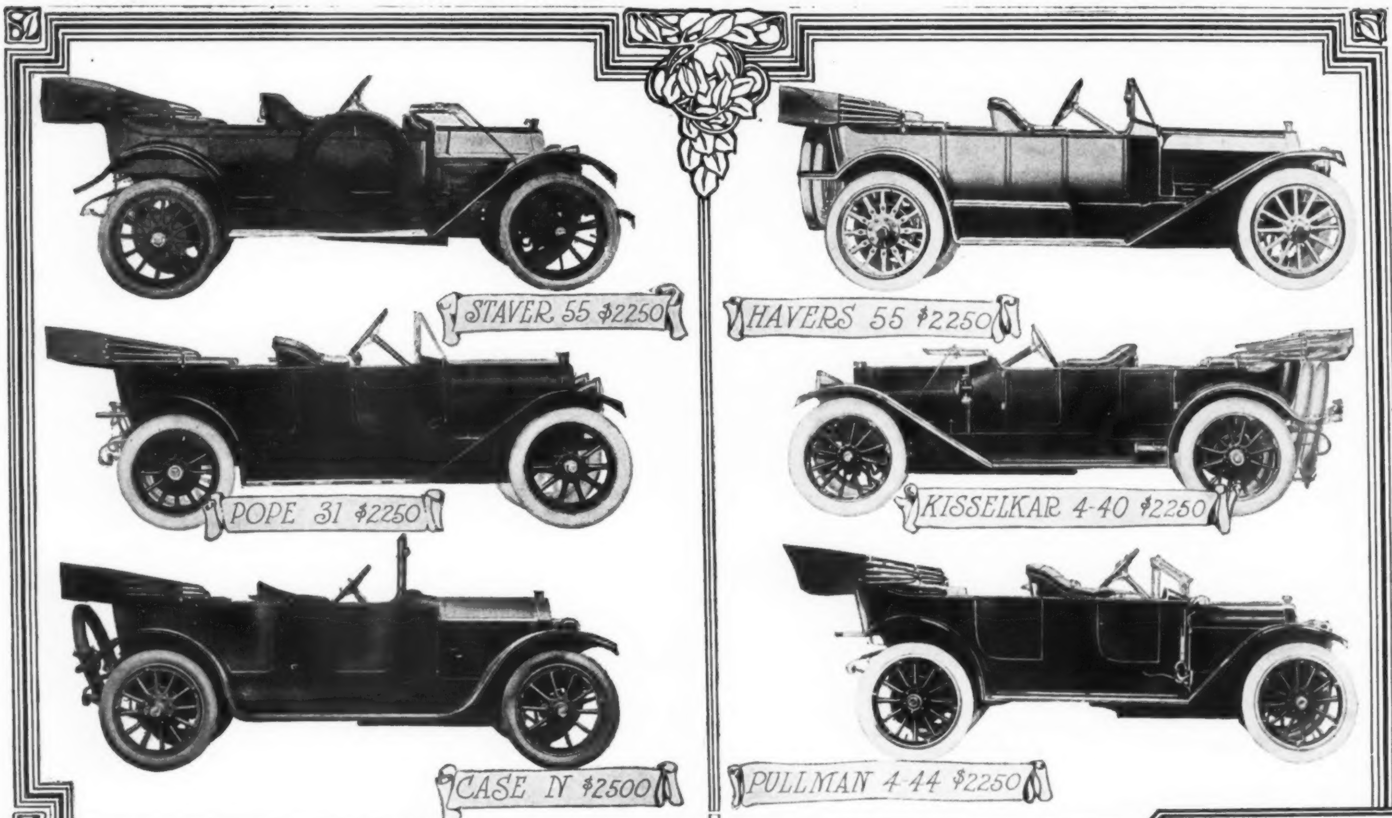
MOTOR	1912			1913		
	Bore	Stroke	Ratio	Bore	Stroke	Ratio
Alcyon	2.9	4.7	1.62	2.9	5.1	1.76
Alcyon	3.1	5.1	1.65	3.1	5.1	1.65
Aries	2.3	3.9	1.70	2.3	3.9	1.70
Aries	2.5	3.9	1.56	2.5	3.9	1.56
Aries	2.9	5.5	1.90	2.9	5.5	1.90
Aries	3.3	5.1	1.55	3.3	5.1	1.55
Aries	4.1	6.2	1.51	4.1	6.2	1.51
Barre	2.5	4.3	1.72	2.5	4.3	1.72
Barre	2.9	5.1	1.76	2.9	5.1	1.76
Bazelaire	2.95	3.9	1.32	2.95	3.9	1.32
Bazelaire	2.99	4.7	1.57	2.99	4.7	1.57
Bazelaire	3.3	5.1	1.55	3.3	5.1	1.55
Berliet	2.7	3.9	1.44	2.7	3.9	1.44
Berliet	3.1	4.7	1.52	3.1	4.7	1.52
Berliet				3.3	5.5	1.67
Berliet	3.9	5.5	1.41	3.9	5.5	1.41
Berliet	4.7	5.5	1.17	4.7	5.5	1.17
Bollee, Leon	3.2	4.3	1.34	3.2	4.3	1.34
Bozier	2.5	5.1	2.04	2.5	5.1	2.04
Bozier	2.9	4.7	1.62	2.9	5.1	1.76
Bozier	2.9	5.9	2.04	2.9	5.9	2.04
Brasier	2.6	4.3	1.65	2.6	4.3	1.65
Brasier	2.7	4.7	1.74	2.7	4.7	1.74
Brasier	3.3	5.5	1.67	3.3	5.5	1.67
Brasier	3.9	5.9	1.51	3.9	5.9	1.51
Buchet	2.9	4.7	1.62	2.9	4.7	1.62
Charron	2.5	4.7	1.88	2.5	4.7	1.88
Charron	3.1	4.7	1.52	3.1	4.7	1.52
Charron	3.7	5.1	1.38	3.7	5.1	1.38
Charron	4.3	5.9	1.37	4.3	5.9	1.37
Chenard & Walcker	2.5	4.7	1.88	2.7	5.1	1.89
Chenard & Walcker	2.9	4.7	1.62	2.9	5.1	1.76
Chenard & Walcker	3.1	5.9	1.58	3.1	5.9	1.58
C. I. D	2.9	4.7	1.62	2.9	4.7	1.62
C. L. C	3.1	5.5	1.78	2.5	5.1	2.04
Clement-Bayard	2.3	4.7	2.04	2.3	4.7	2.04
Clement-Bayard				2.5	4.7	1.88
Clement-Bayard	2.7	4.3	1.59	2.9	4.3	1.48
Clement-Bayard	3.1	4.7	1.52	3.1	5.1	1.65
Clement-Bayard				3.3	5.5	1.67
Clement-Bayard				3.3	5.1	1.55
Clement-Bayard				3.9	5.5	1.41
Corre La Licorne	2.7	4.7	1.74	2.9	4.7	1.62
Corre La Licorne	2.5	5.1	2.04	2.5	5.1	2.04
Corre La Licorne	2.9	5.9	2.03	2.9	5.9	2.03
Corre La Licorne	3.9	5.5	1.41	3.9	5.5	1.41
Cote	2.9	4.1	1.42	2.9	4.7	1.62
Cote	3.1	4.1	1.32	3.1	4.7	1.52
Cote	3.5	4.7	1.34	3.5	4.7	1.34
Cote	3.9	4.7	1.21	3.9	4.7	1.21
Cottin & Desgouttes	3.1	6.2	2.00	3.1	6.2	2.00
Cottin & Desgouttes	3.9	5.5	1.41	3.9	6.2	1.59
Cottin & Desgouttes	4.7	6.2	1.32	4.7	6.2	1.32
Cottin & Desgouttes	5.1	7.8	1.72	5.1	7.8	1.72
Crespelle	2.5	5.1	2.04	2.5	5.1	2.04
Crespelle	2.9	4.7	1.62	2.9	4.7	1.62
Crespelle	2.9	5.9	2.04	2.9	5.9	2.04
Darracq	2.9	4.7	1.62	2.9	4.7	1.62
Darracq	3.9	5.5	1.41	3.9	5.5	1.41
Darracq				3.3	5.1	1.55
Delage	2.5	4.3	1.72	2.5	4.3	1.72
Delage	2.9	4.7	1.62	2.9	5.1	1.76
Delahaye	2.44	3.9	1.60	2.44	3.9	1.60
Delahaye	2.9	4.3	1.48	2.9	4.3	1.48
Delahaye	3.3	5.1	1.55	3.3	5.1	1.55
Delahaye	3.7	5.1	1.38	3.7	5.1	1.38
Delaunay-Belleville	3.3	5.1	1.55	3.3	5.1	1.55
Delaunay-Belleville	3.9	5.5	1.41	3.9	5.5	1.41
De Dion-Bouton	2.5	4.7	1.88	2.5	4.7	1.88
De Dion-Bouton	2.7	5.1	1.89	2.9	5.1	1.76
De Dion-Bouton	3.1	5.5	1.78	3.1	5.5	1.78
De Dion-Bouton	3.9	5.5	1.41	3.9	5.5	1.41
D. P. F	2.5	4.7	1.88	2.5	4.7	1.88
D. P. F	2.7	5.1	1.89	2.7	5.1	1.89
D. P. F	3.1	5.9	1.90	3.1	5.9	1.90
Excelsior	3.3	5.1	1.55	3.3	5.1	1.55
F. L	3.1	3.9	1.26	3.1	3.9	1.26
F. N	2.9	3.5	1.21	2.7	5.1	1.89
F. N	3.1	4.7	1.52	3.3	4.7	1.42
Germain	3.38	4.3	1.27	3.38	4.3	1.27
Germain	3.6	4.3	1.19	3.6	4.3	1.19
Germain	3.1	5.1	1.65	3.1	5.1	1.65
Germain	4.0	4.3	1.07	4.0	4.3	1.07
Germain	4.7	5.1	1.09	4.7	5.1	1.09
Gobron	2.7	5.9	2.19	2.7	5.9	2.19
Gobron				3.1	6.2	2.00
Gobron	3.5	7.0	2.00	3.5	7.0	2.00
Gobron	4.3	9.8	2.28	4.3	9.8	2.28
Gregoire				3.9	6.7	1.72
Gregoire				2.5	5.1	2.04
Gregoire	3.1	4.3	1.39	3.1	4.3	1.39
Gregoire				3.1	5.1	1.65
Gregoire	3.1	6.2	2.00	3.1	6.2	2.00
Hotchkiss	3.1	4.7	1.52	3.1	4.7	1.52
Hotchkiss	3.7	5.1	1.38	3.7	5.1	1.38
Hotchkiss	4.3	5.9	1.37	4.3	5.9	1.37
Hurtu	2.7	3.9	1.45	2.7	4.3	1.59
Hurtu	3.1	4.3	1.39	2.9	4.7	1.62
La Buire				2.5	5.1	2.04
La Buire	2.7	5.9	2.18	2.7	5.9	2.18
La Buire	3.1	6.2	2.00	3.1	6.2	2.00
La Buire	3.3	5.5	1.67	3.3	5.5	1.67
La Buire	3.5	6.2	1.77	3.5	6.2	1.77
Lorraine-Dietrich	2.7	4.7	1.74	2.7	4.7	1.74
Lorraine-Dietrich	3.5	5.1	1.46	3.5	5.1	1.46
Lorraine-Dietrich	4.9	6.2	1.27	4.9	6.7	1.37

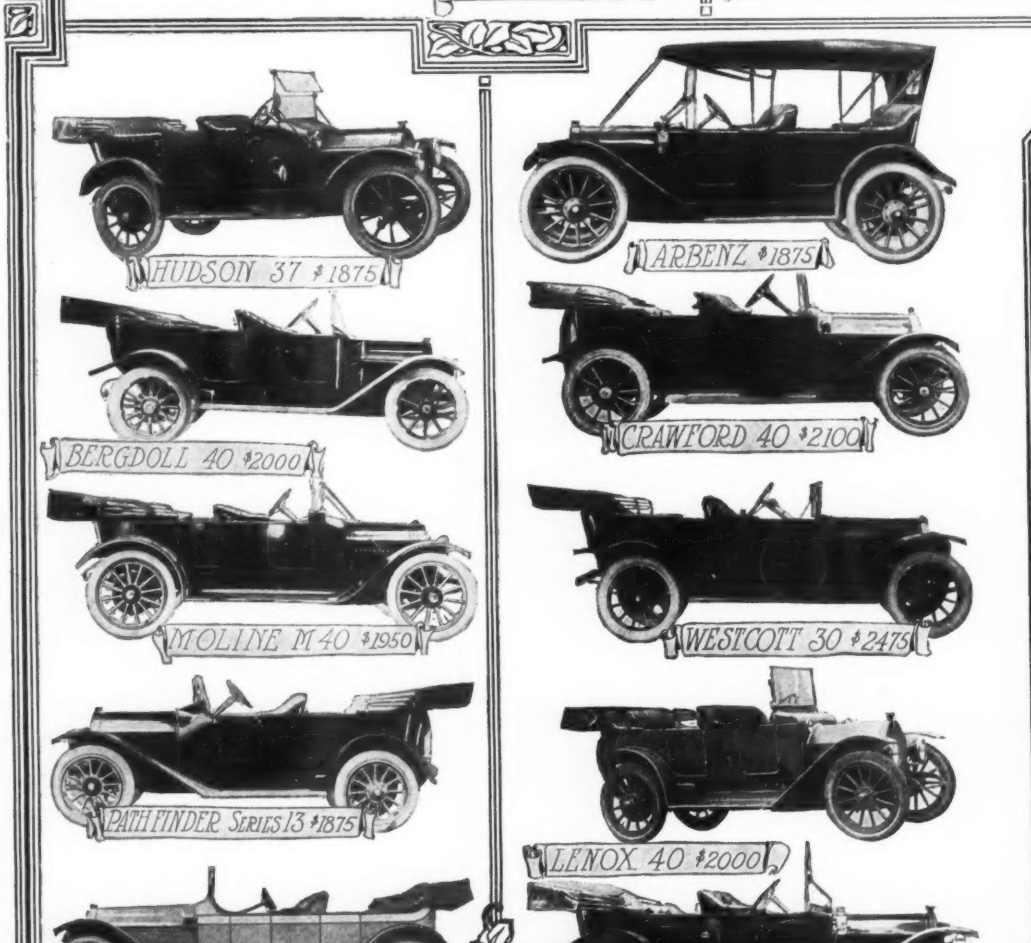
MOTOR	1912			1913		
	Bore	Stroke	Ratio	Bore	Stroke	Ratio
Martini	3.1	4.7	1.52	3.1	4.7	1.52
Martini	3.5	5.5	1.57	3.5	5.5	1.57
Martini				3.5	5.5	1.57
Mors	2.9	4.7	1.62	2.9	4.7	1.62
Mors	3.1	4.7	1.52	3.3	5.9	1.79
Mors				2.9	4.7	1.62
Mors				3.5	5.1	1.46
Mors				3.9	5.5	1.41
Mors				4.8	5.9	1.23
Motobloc	2.5	4.7	1.88	2.5	4.7	1.88
Motobloc	3.1	4.7	1.52	3.1	4.7	1.52
Motobloc	3.1	5.8	1.87	3.1	5.8	1.87
Motobloc	3.5	5.1	2.04	3.5	5.1	2.04
Motobloc	3.5	6.2	1.77	3.5	6.2	1.77
N. A. G				2.9	3.3	1.14
N. A. G				2.9	4.6	1.59
N. A. G				3.2	4.7	1.47
N. A. G				3.5	5.1	1.46
N. A. G				4.9	9.9	2.02
N. A. G				5.1	6.2	1.22
Nagent	2.7	4.6	1.70	2.9	4.6	1.59
Nagent	3.5	4.7	1.34	3.2	4.7	1.47
Nagent	3.5	5.1	1.46	3.5	5.1	1.46
Nagent	4.17	5.1	1.22	4.5	4.9	1.09
Nagent	4.1	6.2	1.51	5.1	6.2	1.21
Panhard-Levassor				2.7	5.5	2.04
Panhard-Levassor	3.1	4.7	1.52	3.1	4.7	1.52
Panhard-Levassor				3.1	5.1	1.65
Panhard-Levassor	3.9	5.1	1.31	3.9	5.5	1.41
Peugeot				2.1	3.5	1.67
Peugeot	2.7	5.1	1.89	2.6	5.1	1.96
Peugeot	3.1	5.1	1.65	3.1	5.1	1.65
Peugeot				3.1	5.5	1.78
Peugeot	3.5	5.9	1.69	3.5	5.9	1.69
Peugeot				3.7	6.2	1.67
Peugeot	3.6	5.9	1.61	3.6	5.9	1.61
Peugeot	3.9	6.2	1.59	3.9	6.2	1.59
Peugeot				4.7	7.8	1.66
Piccard-Pictet	3.1	4.7	1.52	3.1	4.7	1.52
Piccard-Pictet				3.1	5.5	1.78
Piccard-Pictet	3.5	5.1	1.46	3.5	5.9	1.69
Piccard-Pictet				3.5	6.7	1.92
Piccard-Pictet	3.9	5.5	1.41	3.9	5.9	1.51
Pilain	2.5	4.7	1.88	2.5	4.7	1.88
Pilain				2.1	4.3	2.05
Pilain	2.9	4.3	1.48	2.9	4.3	1.48
Pilain	3.5	4.7	1.34	3.5	4.7	1.34
Pilain				3.3	7.2	2.18
Pilain	3.9	4.7	1.21	3.9	5.5	1.41
Pilain	4.8	5.5	1.15	4.8	5.5	1.15
Pipe	2.9	4.3	1.48	2.9	4.3	1.48
Pipe	3.1	5.9	1.90	3.1	5.9	1.90
Pipe	3.9	7.0	1.80	3.9	7.0	1.80
Pipe	5.5	7.0	1.27	5.5	7.0	1.27
Renault	3.1	4.7	1.52	3.1	4.7	1.52
Renault	3.5	5.5	1.57	3.5	5.5	1.57
Renault	3.9	6.3	1.62	3.9	6.3	1.62
Renault	5.1	6.3	1.24	5.1	6.3	1.24
Rolland-Pilain	2.7	4.3	1.59			
Rolland-Pilain	3.1	4.3	1.39			
Rolland-Pilain	3.1	5.5	1.77			
Rolland-Pilain	3.3	5.5	1.67			
Rolland-Pilain	4.1	5.9	1.44			
Rolland-Pilain	4.3	6.4	1.49			
Rolland-Pilain	5.1	6.4	1.26			
Rolland-Pilain	5.1	10.6	2.08			
Rossel	2.5	5.3	2.12	2.5	5.3	2.12
Rossel	2.9	5.9	2.04	2.9	5.9	2.04
Rossel	3.5	4.3	1.23	3.5	4.3	1.23
Rossel	3.1	4.3	1.39	3.1	4.3	1.39
Roy	3.1	4.7	1.52	3.1	5.1	1.65
Roy	3.5	5.5	1.57	3.5	5.5	1.57
Schneider	2.7	4.7	1.74	2.7	4.7	1.74
Schneider				2.9	5.1	1.76
Schneider	3.1	5.1	1.65	3.1	5.5	1.78
Schneider	3.7	5.1	1.38	3.1	5.9	1.90
Schneider	4.1	5.9	1.44	4.3	6.3	1.47
Sizaire-Naudin	2.7	6.7	2.48	2.7	6.7	2.48
Sizaire-Naudin				2.5	4.3	1.72
Sizaire-Naudin				2.9	4.7	1.62
S. P. A	2.7	4.7	1.74	2.7	4.7	1.74
S. P. A	3.1	4.7	1.52	3.1	4.7	1.52
S. P. A	3.9	5.5	1.41	3.9	5.5	1.41
S. P. A	5.1	5.7	1.12	4.3	7.8	1.82
Stimula	2.7	4.3	1.59	2.9	4.7	1.62
Stimula	3.4	4.3	1.27	3.4	4.3	1.27
Stimula	3.1	4.3	1.39	3.1	4.3	1.39
Turcat-Mery	3.1	5.1	1.65	3.1	5.1	1.65
Turcat-Mery	3.5	5.1	1.46	3.5	5.1	1.46
Turcat-Mery	3.9	5.1	1.31	3.9	5.1	1.31
Turcat-Mery				4.3	6.3	1.47
Unic				2.5	4.3	1.72
Unic	2.9	4.7	1.62	2.9	4.7	1.62
Unic	3.5	4.7	1.34	3.5	5.1	1.46
Vermorel				2.6	4.7	1.81
Vermorel	2.9	4.7	1.62	2.9	4.7	1.62
Vermorel	3.5	5.1	1.46	3.5	5.1	1.46
Vinot	2.7	4.3	1.59	2.7	4.3	1.59
Vinot	3.1	4.3	1.39	3.1	5.1	1.65
Vinot	4.0	5.1	1.28	3.97	5.1	1.28
Vivinus	3.1	4.7	1.52	3.1	4.7	1.52
Vivinus	3.5	5.1	1.46	3.5	5.1	1.46
Zebre	1.96	3.9	1.99	1.96	3.9	1.99
Zebre	3.6	4.7	1.28	3.6	4.7	1.28
Zedel	2.8	4.7	1.68	2.8	4.7	1.68
Zedel	3.5	5.5	1.57	3.5	5.5	1.57

The CARS of 1913 Illustrated

CARS for 1913 are illustrative of a number of tendencies which have been growing for several years and have become sufficiently crystallized in this year's products to make them very noticeable. The first thing that strikes the casual observer of the cars as a whole is the increased beauty of line combined with utility of design which is exhibited. Long, flowing lines, easy curves, and smooth, clean-cut appearance are the rule this year instead of the exception among the open bodies, while in the closed cars two opposing tendencies which have been gaining for years have resulted in two distinct types of design, diametrically opposite in intent. One of these is the colonial style, which this year has been carried to a point almost of exaggeration, while the other is the stream-line effect, with its sweeping curves and subdued corners.

¶ Electric lighting and electric starting are the feature of the year in all classes of cars. Except in the very cheapest, electricity is relied upon to furnish not only the power for lighting the car but at the same time is utilized to take the place of the laborious hand cranking. This is only the latest evidence of the effort toward ease of operation and riding which is the aim of the engineers. The effort has resulted also in longer and more flexible springs, longer wheelbase and deeper upholstering.





Five-Seated Touring Cars

THE losses in numbers are not evenly distributed. They are more pronounced in the high and low-priced classes and a distinct gain is shown in the division listing at $1,250-$2,000.

In the $1,000 division thirty-one models are made. This compares with fifty-two in 1912.

In the $1,500 class there has been a striking increase in touring car manufacture.

In 1913 there are 232 models, embracing 134 touring cars.

Staver 55. $2,250. 32.4 H.P., 120 W.B., 36 x 4 tires.
Pope 31. $2,250. 30.1 H.P., 118½ W.B., 36 x 4½.
Case N. $2,500. 27.25 H.P., 115 W.B., 34 x 4 tires.
Havers 55. $2,250. 38.4 H.P., 128 W.B., 36 x 4 tires.
Kisselkar 4-40. $2,250. 32.4 H.P., 121 W.B., 35 x 4½ and 35 x 4 tires.
Pullman 4-44, $2,250. 32.4 H.P., 122 W.B., 36 x 4 tires.
Hudson 37. $1,875. 27.25 H.P., 118 W.B., 36 x 4 tires.
Arbenz, $1,875. 27.3 H.P., 120 W.B., 36 x 4 tires.
Bergdoll 40, $2,000. 25.5 H.P., 121 W.B., 36 x 4 tires.
Crawford 40, $2,100. 32.4 H.P., 125 W.B., 36 x 4 tires.
Moline M-40, $1,950. 27.25 H.P., 124 W.B., 36 x 4 tires.
Westcott 30, $2,475. 38.4 H.P., 127 W.B., 37 x 4½ tires.
Pathfinder 13. $1,875. 27.25 H.P., 120 W.B., 36 x 4 tires.
Lenox 40, $2,000. 28.9 H.P., 118 W.B., 36 x 4 tires.
Nyberg 6-60, $2,000. 43.8 H.P., 128 W.B., 36 x 4 tires.
Palmer-Singer, $2,000. 38.4 H.P., 127 W.B., 36 x 4 tires.

Tourists of Medium Price

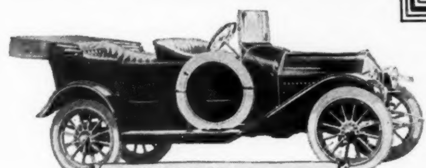
IN the $2,500 class there are 234 models and 143 touring cars against 288 models and 176 touring cars last year.

In the $4,000 class there are 322 models and 137 touring cars against 408 models and 173 touring cars in 1912.

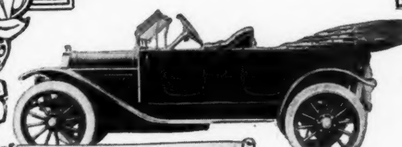
Prices are steady to strong throughout the industry for the reason pointed out.

The tables show that the division listing between $1,250 and $2,000 has increased in number of manufacturers, number of models, and, of course, in volume of production.

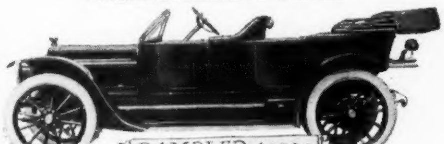
Jackson Majestic, $1,850. 32.4 H.P., 124 W.B., 36 x 4 tires.
Schacht N. S., $1,775. 28.9 H.P., 120 W.B., 36 x 4 tires.
Rambler, $1,700. 32.4 H.P., 120 W.B., 36 x 4 tires.
Enger P, $1,750. 32.4 H.P., 120 W.B., 36 x 4 tires.
Marion 48A, $1,850. 27.25 H.P., 120 W.B., 36 x 4 tires.
Herreshoff 6, $1,700. 27.25 H.P., 124 W.B., 34 x 4 tires.
Richmond P., $1,750. 32.4 H.P., 120 W.B., 36 x 4 tires.
Stoddard-Dayton 30, $1,450. 25 H.P., 112 W.B., 34 x 4 tires.
Abbott-Detroit D, $1,750. 27.3 H.P., 116 W.B., 34 x 4 tires.
Cartercar 5A, $1,700. 27.25 H.P., 116 W.B., 36 x 4 tires.
Pratt 50, $1,850. 32.4 H.P., 120 W.B., 36 x 4 tires.
Imperial 34, $1,650. 32.4 H.P., 118 W.B., 36 x 4 tires.
Ames 40, $1,635. 27.3 H.P., 118 W.B., 36 x 4 tires.
Glide 36-42, $1,600. 27.25 H.P. 118 W.B., 34 x 4 tires.
Michigan 40R, $1,585. 28.9 H.P., 118 W.B., 35 x 4½ tires.
Great Western, $1,585. 28.9 H.P., 118 W.B., 26 x 4 tires



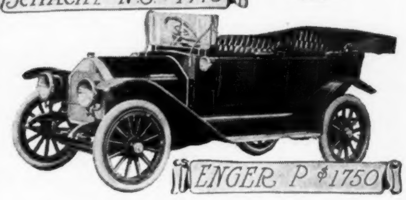
JACKSON MAJESTIC $1850



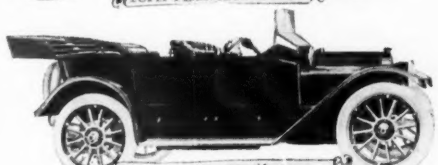
SCHACHT N.S. $1775



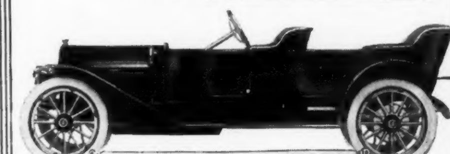
RAMBLER $1700



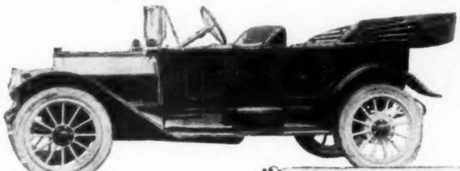
ENGER P $1750



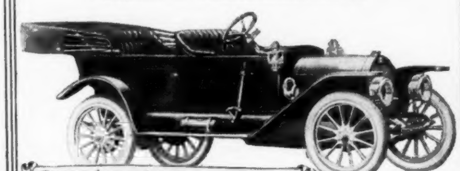
MARION 48 A $1850



HERRESHOFF SIX $1700



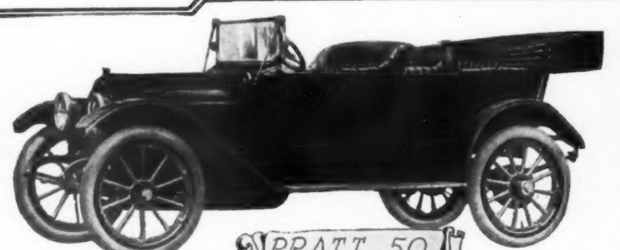
RICHMOND P $1750



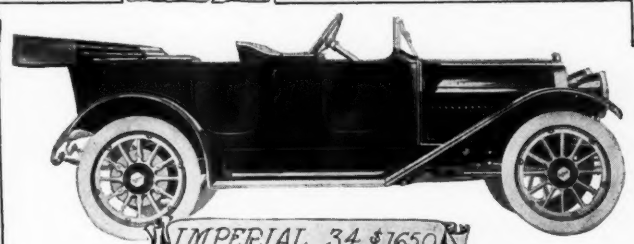
STODDARD-DAYTON 30 $1450

ABBOTT-DETROIT-D-$1750

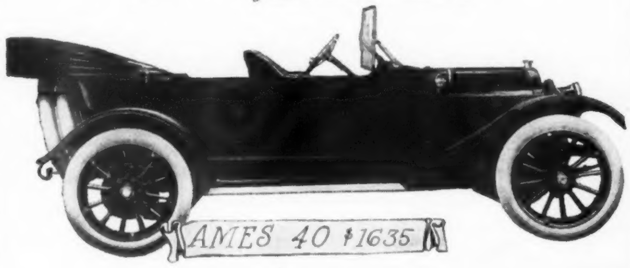
CARTERCAR 5A $1700



PRATT 50



IMPERIAL 34 $1650

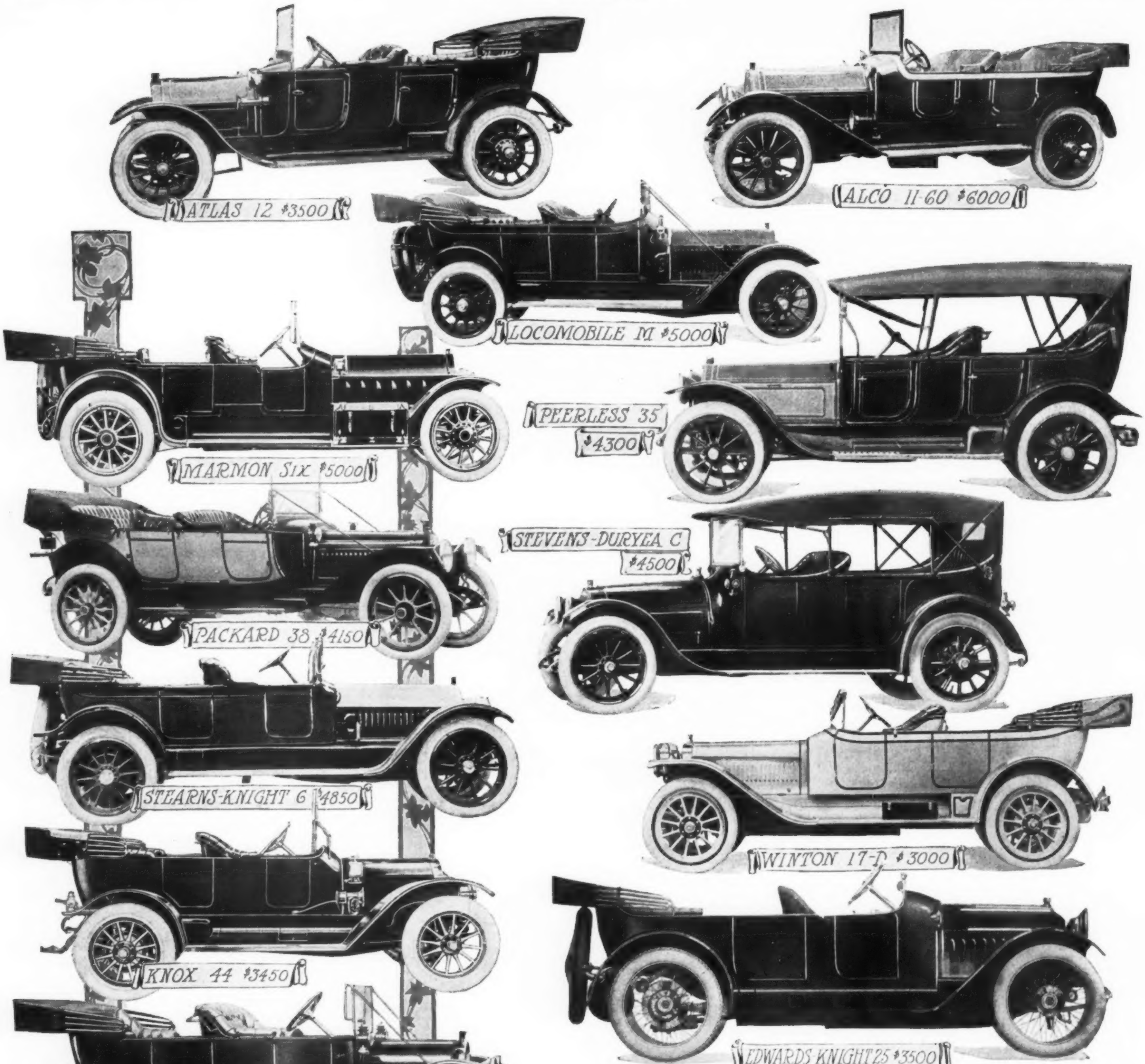


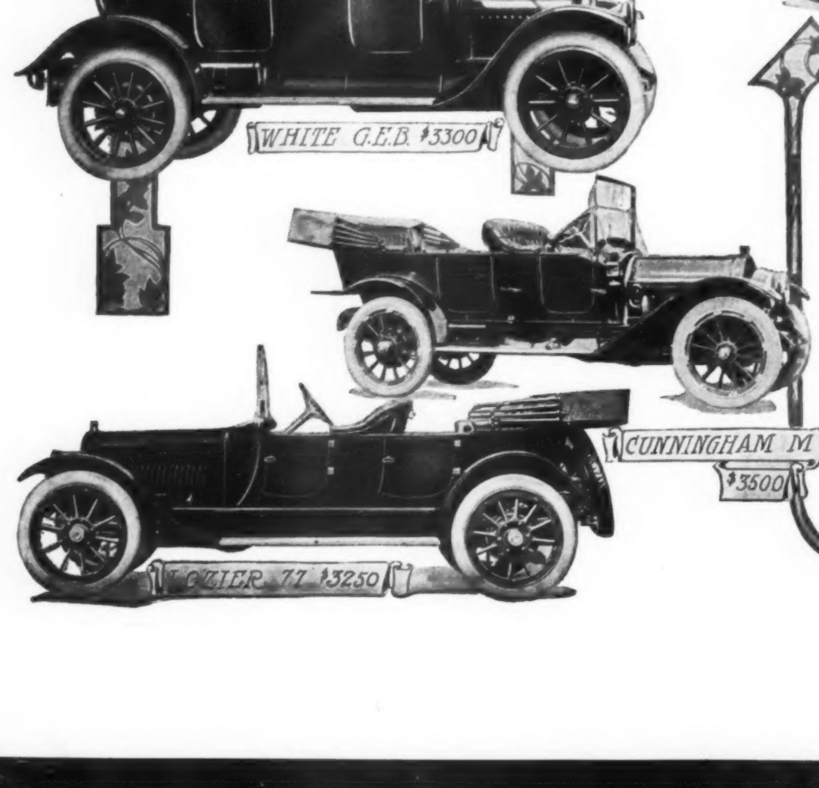
AMES 40 $1635

GLIDE 36-42-$1600

MICHIGAN 40 $1585

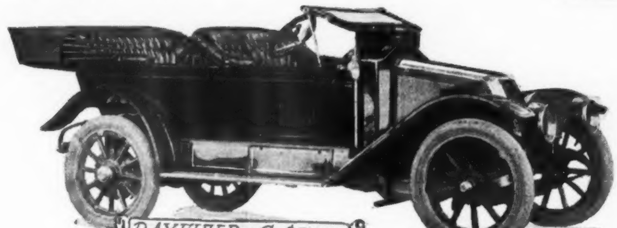
GREAT WESTERN $1585

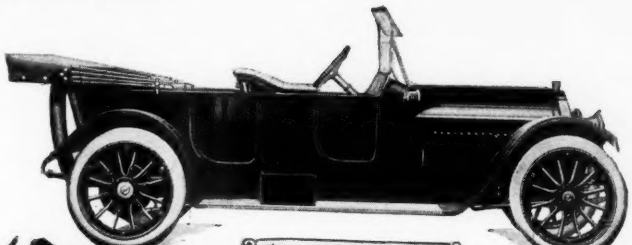


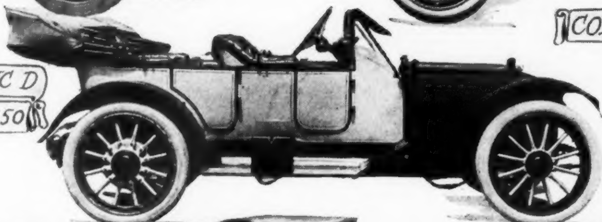


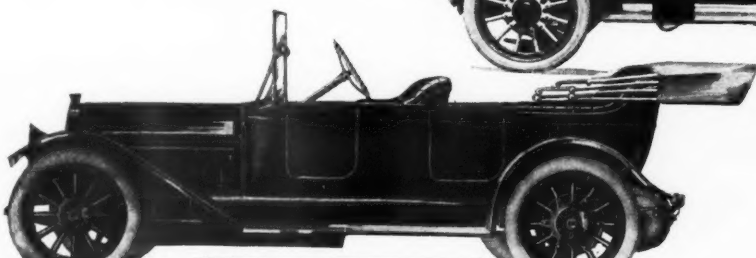
Five-Passenger Touring Cars at $3000 to $6000

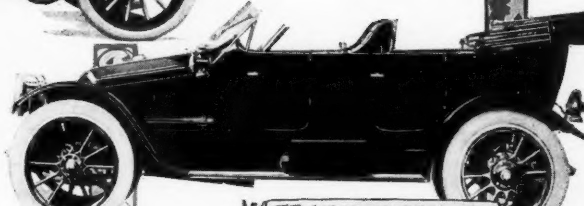
Atlas 12, $3,500. 32.4 H.P., 130 W.B., 37 by 5 tires.
Alco 11-60, $6,000. 54.1 H.P., 133½ W.B., 36 by 4½ and 37 x 5 tires.
Locomobile M, $5,000. 48.6 H.P., 136 W.B., 36 x 4½ and 37 x 5 tires.
Marmon Six, $5,000. 48.6 H.P., 145 W.B., 36 x 4½ and 37 x 5 tires.
Peerless 35, $4,300. 38.4 H.P., 125 W.B., 36 x 4½ tires.
Packard 38, $4,150. 38.4 H.P., 134 W.B., 36 x 4½ and 37 x 5 tires.
Stevens-Duryea C, $4,500. 46.1 H.P., 131 W.B., 37 x 4½ tires.
Stearns-Knight Six, $4,850. 43.8 H.P., 134 W.B., 37 x 5 tires.
Winton 17D, $3,000. 48-6 H.P., 130 W.B., 36 x 4½ tires.
Knox 44, $3,450. 40 H.P., 122 W.B., 36 x 4½ tires.
Edwards-Knight 25, $3,500. 25.6 H.P., 120 W.B., 36 x 4½ tires.
White GEB, $3,300. 28.9 H.P., 120 W.B., 36 x 4½ tires.
Cunningham M, $3,500. 36.1 H.P., 124 W.B., 36 x 4½ tires.
Lozier 77, $3,250. 31.6 H. P., 127½ W.B., 36 x 4½ tires.

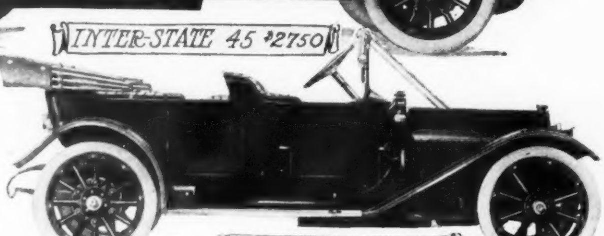

RAYFIELD C $2500


COLE SIX $2485

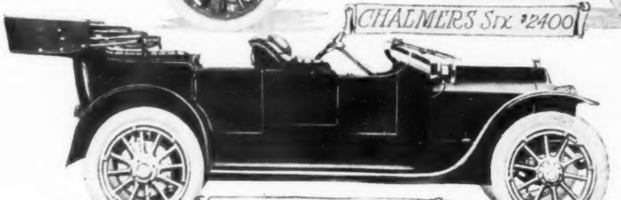

REPUBLIC D $2350


INTER-STATE 45 $2750

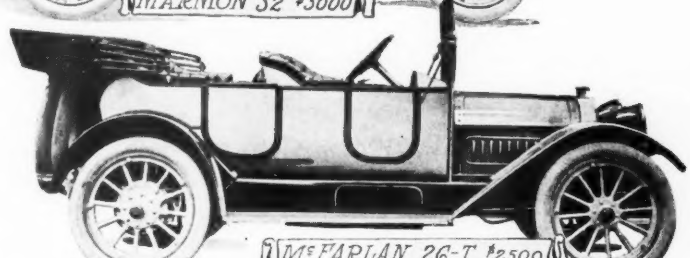

FRANKLIN M $2900

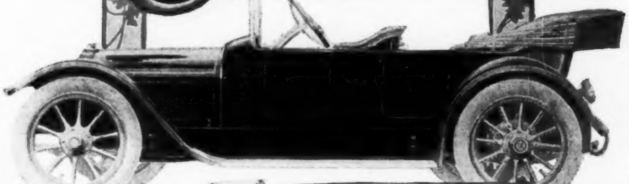

CHALMERS SIX $2400

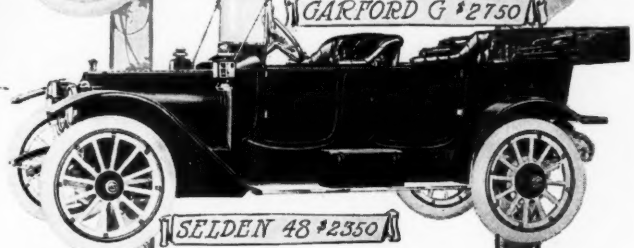

SPEEDWELL SIX $2850


MARMON 32 $3000

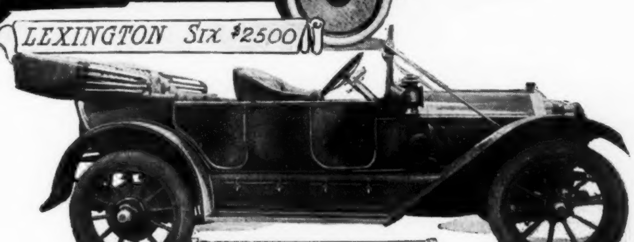

PREMIER 6-40 $2750


McFARLAN 26-T $2500


GARFORD G $2750

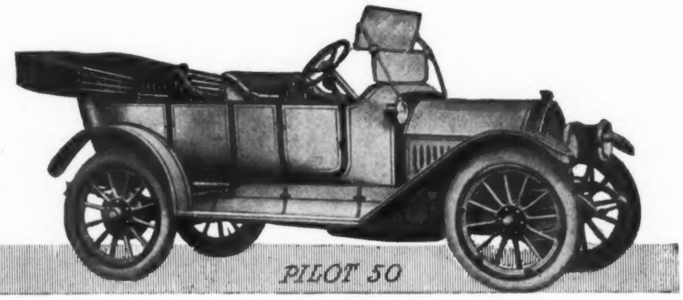

SELDEN 48 $2350

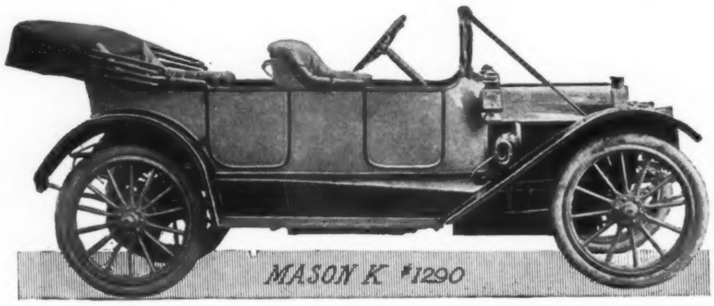

LEXINGTON SIX $2500

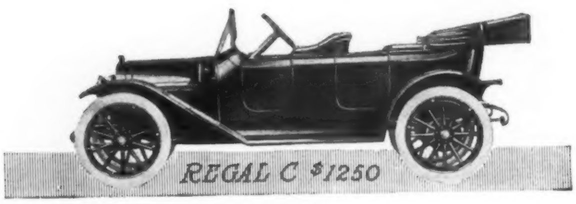

OLDSMOBILE $2500

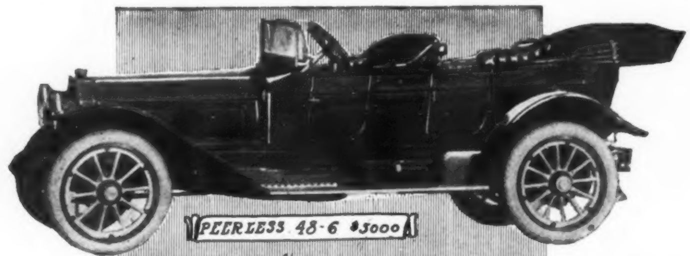
Open Cars *for* Five Passengers at $2400 *to* $3000

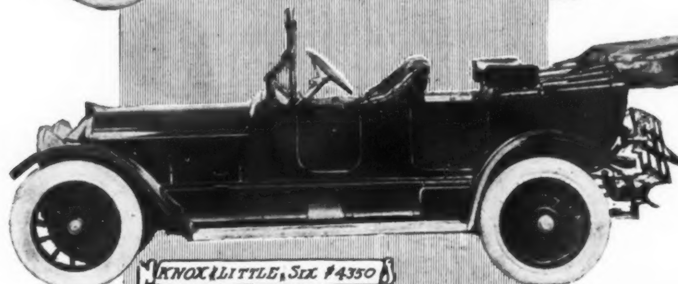
Rayfield C, $2,500. 29.4 H.P., 117 W.B., 34 x 4 tires.
Cole 60, $2,485. 40.9 H.P., 132 W.B., 37 x 4½ tires.
Republic D, $2,350. 28.9 H.P., 120 W.B., 36 x 4 tires.
Inter-State 45, $2,750. 38.4 H.P., 132 WB., 36 x 4½ tires.
Franklin M, $2,900. 31.6 H.P., 116 W.B., 34 x 4½ tires.
Chalmers 18, $2,400. 43.8 H.P., 130 W.B., 36 x 4½ tires.
Speedwell Six, G, $2,850. 40.9 H.P., 134 W.B., 36 x 4½ tires.
Marmon 32, $3,000. 32.4 H.P., 120 W.B., 35 x 4½ tires.
Premier 6-40, $2,750. 38.4 H.P., 132 W.B., 36 x 4½ tires.
McFarlan T, $2,500. 38.4 H.P., 124 W.B., 37 x 4½ tires.
Garford G, $2,750. 33.75 H.P., 128 W.B., 36 x 4½ tires.
Selden 48, $2,350. 36.1 H.P., 125 W.B., 36 x 4 tires.
Lexington 13-6, $2,500. 40.9 H.P., 129 W.B., 36 by 4½ tires.
Oldsmobile, $2,500.

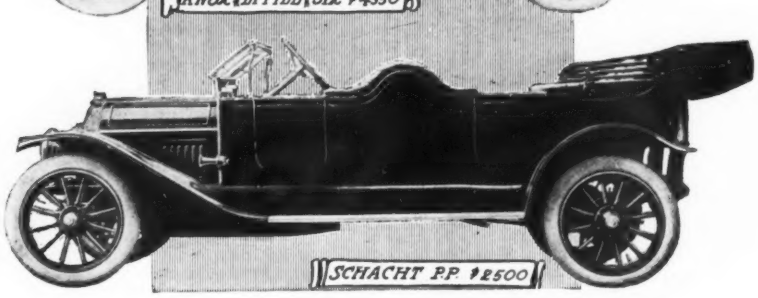


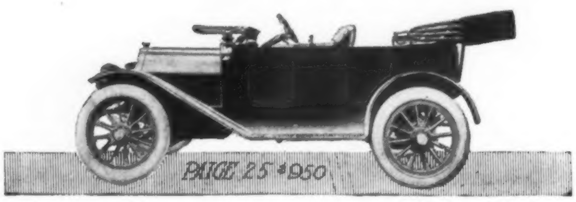


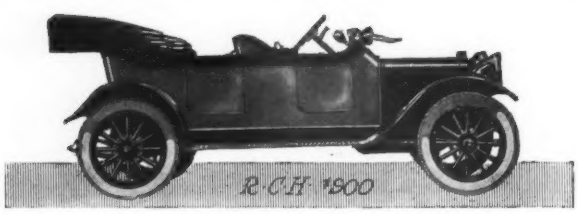








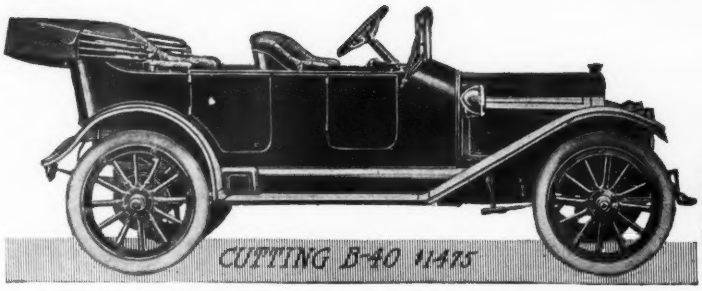


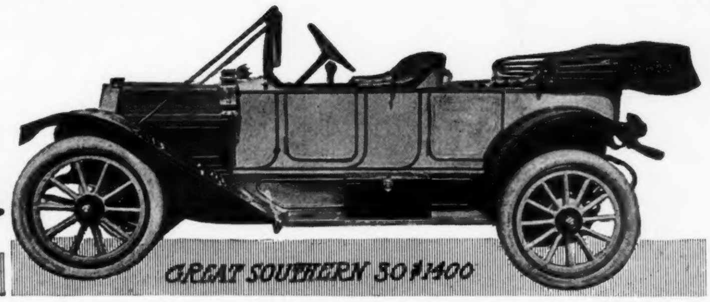


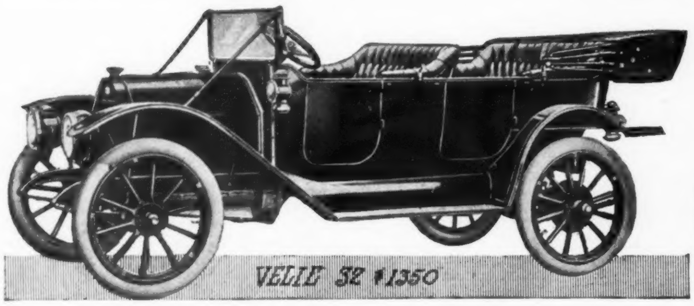
Six Seaters and Low Priced Touring Cars

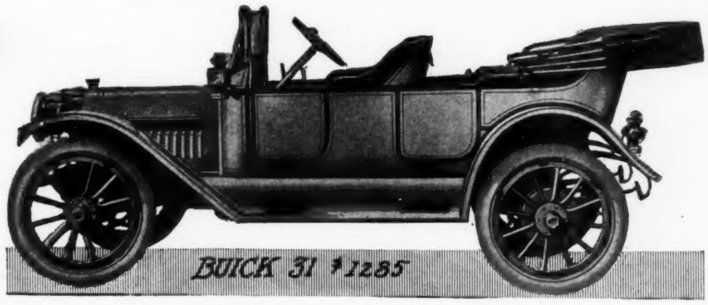
STRAIGHT, clean side lines, rounded lower rear sections of the body with more grace in the outward sweep of the rear seat, all of which are designed to prevent dust annoyance and to minimize wind-resistance, are the actual practical advances and betterments of the season.

Henderson 47, six passengers, $1,485. 27.25 H.P., 116 W.B., 34 x 4 tires.
Pilot 50, $2,250. 32.4 H.P., 126 W.B., 36 x 4 tires.
Mason K, $1,290. 25.6 H.P., 116 W.B., 36 x 3½ tires.
Marathon Winner, $1,375. 28.9 H.P., 116 W.B., 34 x 4 tires.
Regal C, $1,250. 25.6 H.P., 116 W.B., 34 x 4 tires.
Peerless, six passengers, $5,000. 48.6 H.P., 137 W.B., 36 x 4½ and 37 x 5 tires.
Maxwell 50, $1,150. 25.6 H.P., 106 W.B., 32 x 3½ tires.
Oakland 35, $1,075. 19.6 H.P., 112 W.B., 32 x 3½ tires.
Paige 25, $950. 22.5 H.P., 110 W.B., 32 x 3½ tires.
R.C.H., $900. 16.9 H.P., 110 W.B., 32 x 3½ tires.
Studebaker 25, $885. 19.6 H.P., 101 W.B., 30 x 3½ tires.
Knox 46, six passengers, $4,350. 45.96 H.P., 134 W.B., 38 x 5 tires.
Schacht, N. S., six passengers, $2,500. 28.9 H.P., 120 W.B., 36 x 4 tires.


CUTTING B-40 $1475

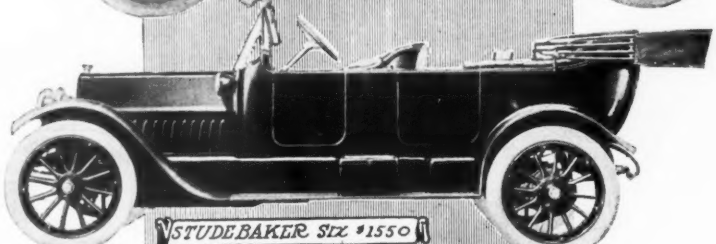

GREAT SOUTHERN 30 $1400

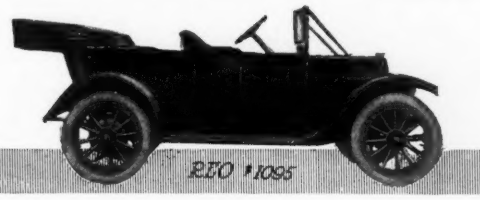

VELIE 32 $1350

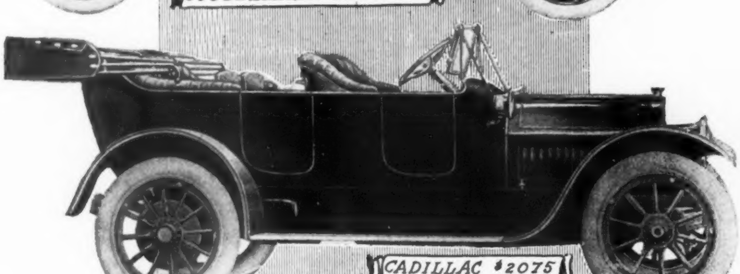

BUICK 31 $1285


MC. FARLAN 27 T $2500

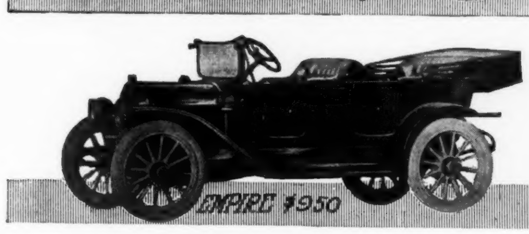

LAMBERT 99 $1250

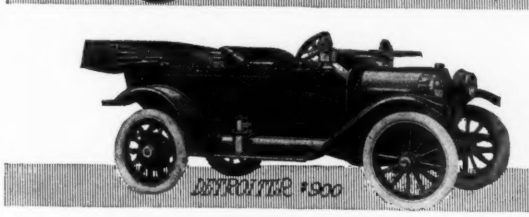

STUDEBAKER Six $1550

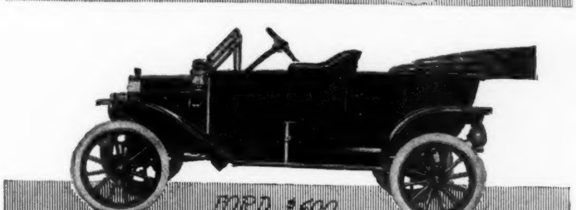

REO $1095


CADILLAC $2075


OVERLAND 30 $985


EMPIRE $950

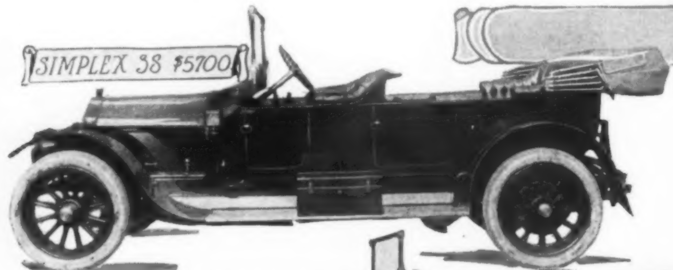

DETROITER $900

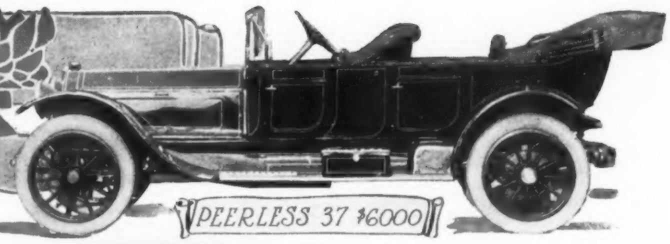

FORD $600

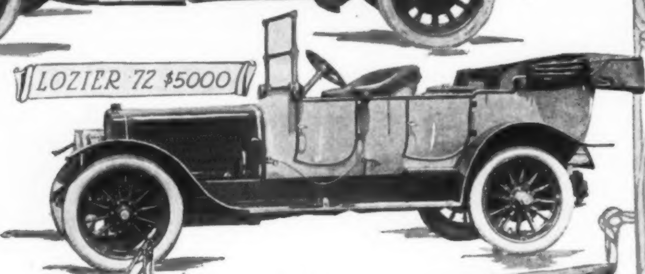
Five and Six Passenger Cars of Low Price

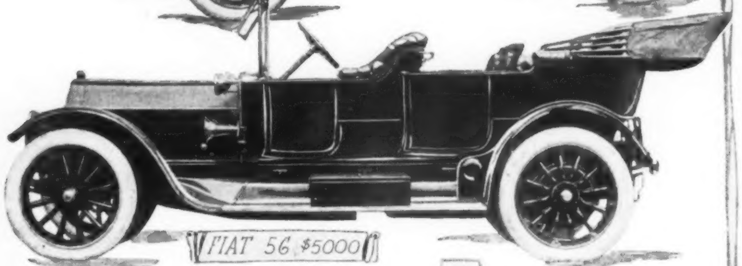
IMPROVEMENTS in touring bodies are generally developments of ideas thoroughly outlined in 1912. The most striking thing about the current touring car is its cleanness of outline. Throughout the offerings of 1913 the running boards are free from incumbrance.

Cutting B-40, $1,475. 25.6 H.P., 120 W.B., 36 x 4 tires.
Great Southern 30, $1,400. 25.6 H.P., 113 W.B., 34 x 4 tires.
Velie 32, $1,350. 22.5 H.P., 110 W.B., 34 x 3½ tires.
Buick 31, $1,285. 25.6 H.P., 108 W.B., 34 x 4 tires.
McFarland 27T, $2,500. 38.4 H.P., 124 W.B., 37 x 4½ tires.
Lambert 99, $1,250. 28.9 H.P., 117 W.B., 34 x 3½ tires.
Studebaker Six, six passengers, $2,550. 29.4 H.P., 121 W.B., 34 x 4 tires.
Reo 5, $1,095. 25.6 H.P., 112 W.B., 34 x 4 tires.
Cadillac, six passengers, $2,075. 32.4 H.P., 120 W.B., 36 x 4½ tires.
Overland, $985. 25.6 H.P., 110 W.B., 32 x 3½ tires.
Empire, $950. 19.6 H.P., 104 W.B., 32 x 3½ tires.
Detroiter, $900. 18.25 H.P., 104 W.B., 32 x 3½ tires.
Ford, $525. 22.5 H.P., 100 W.B., 30 x 3 tires.





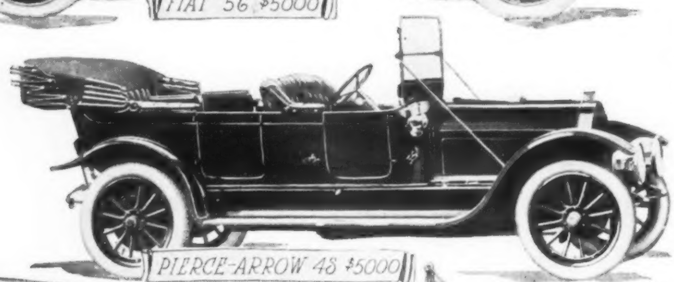


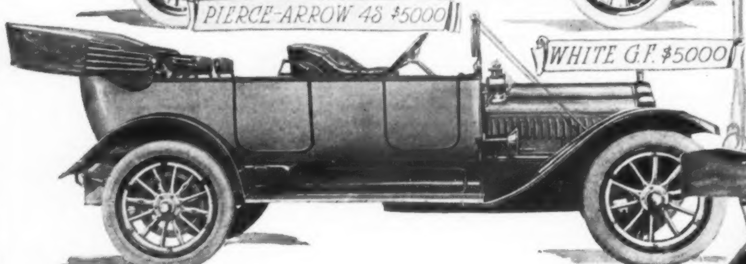


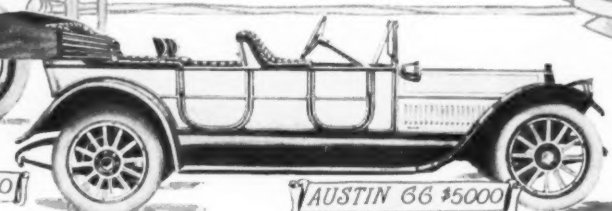
Seven-Passenger Touring Cars at $5000 *to* $6000

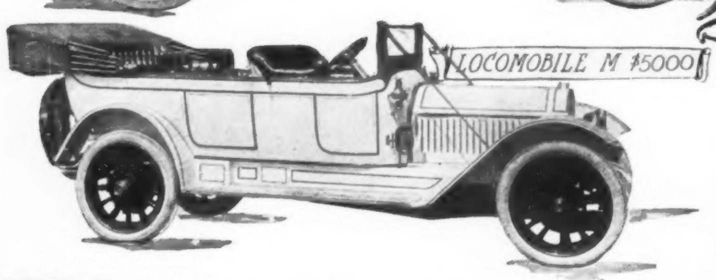
A VIEW of the seven-passenger touring car offerings of the year will explain some vital truths about the industry itself. There are ninety-one current models, against ninety last year. On the face of the tables it would seem as if only a slight increase had been scored for the seven-passenger car, while the truth is that the increase has been very large. In 1912 almost every manufacturer of large cars put out a foredoor model and a model without foredoors and the total appeared in the summaries. As an example, the Simplex put out five models of seven-passenger touring cars in 1912 and in 1913 the number listed is two.

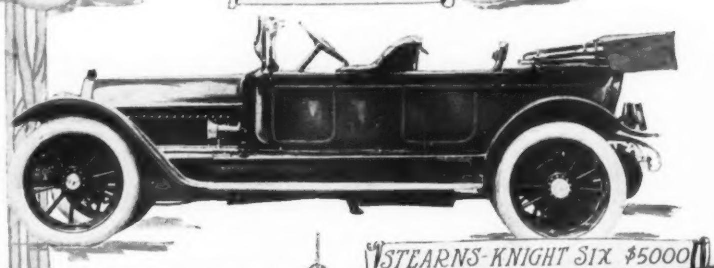
Peerless, $6,000. 60 H.P., 140 W.B., 38 x 5½ tires.
Oldsmobile, $5,000. 40.9 H.P., 13 W.B., 36 x 4½ tires.
Simplex, $5,700. 38 H.P., 137 W.B., 35 x 5 tires.
Lozier 72, $5,000. 51.6 H.P., 131 W.B., 36 x 4½ and 27 x 5 tires.
Fiat 56, $5,000. 46.65 H.P., 135 W.B., 36 x 4½ and 37 x 5 tires.
Pierce-Arrow 48D, $5,000. 48.6 H.P., 134½ W.B., 37 x 5 tires.
White G. F., $5,000. 43.8 H.P., 132 W.B., 37 x 5 tires.
Austin 66, $5,000.
Locomobile M, $5,000. 48.6 H.P., 136 W.B., 36 x 4½ and 37 x 5 tires.
Stoddard-Dayton-Knight, $5,000. 48.6 H.P., 133 W.B., 36 x 5 tires.
Stearns-Knight Six, $5,000. 43.8 H.P., 140 W.B., 37 x 5 tires.
Packard 48, $4,850. 48.6 H.P., 139 W.B., 36 x 4½ and 37 x 5 tires.

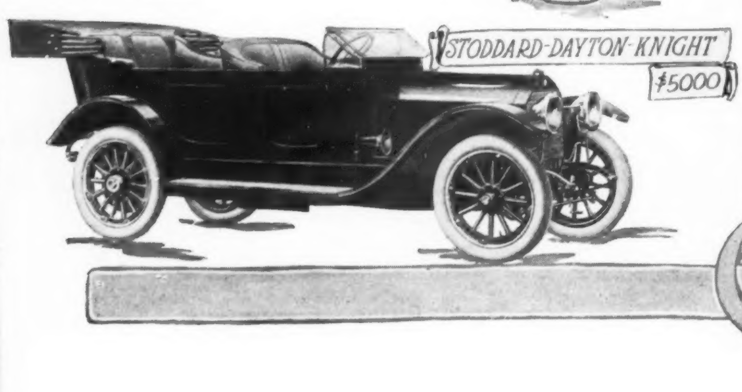


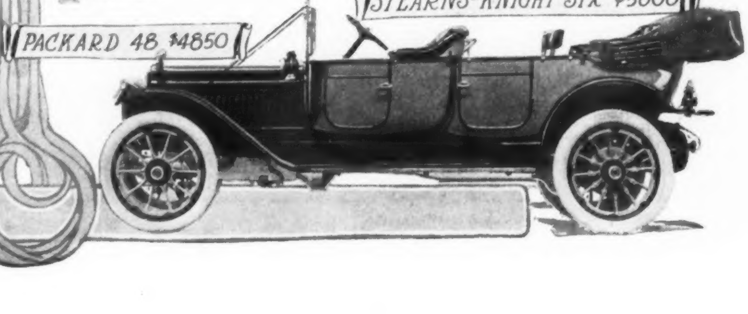


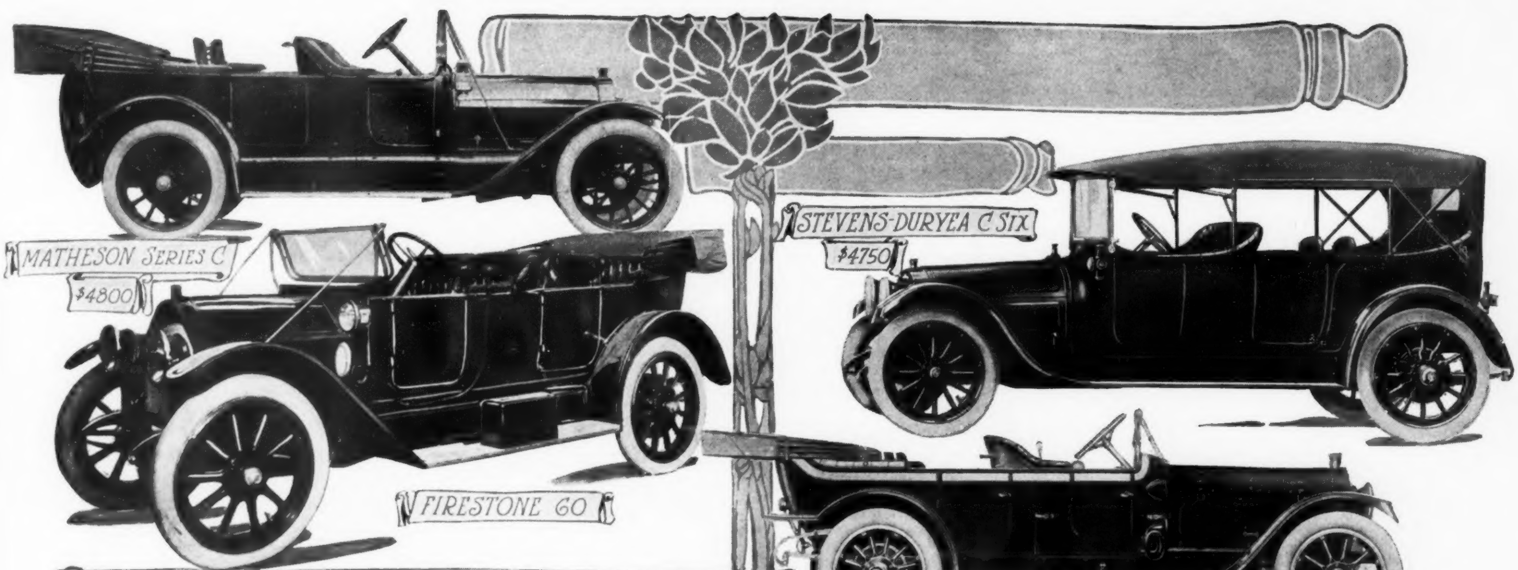








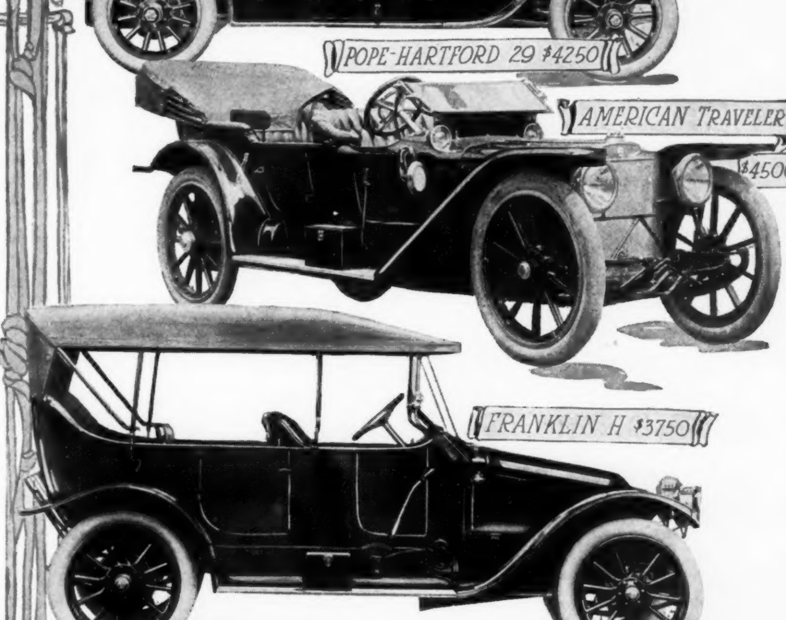


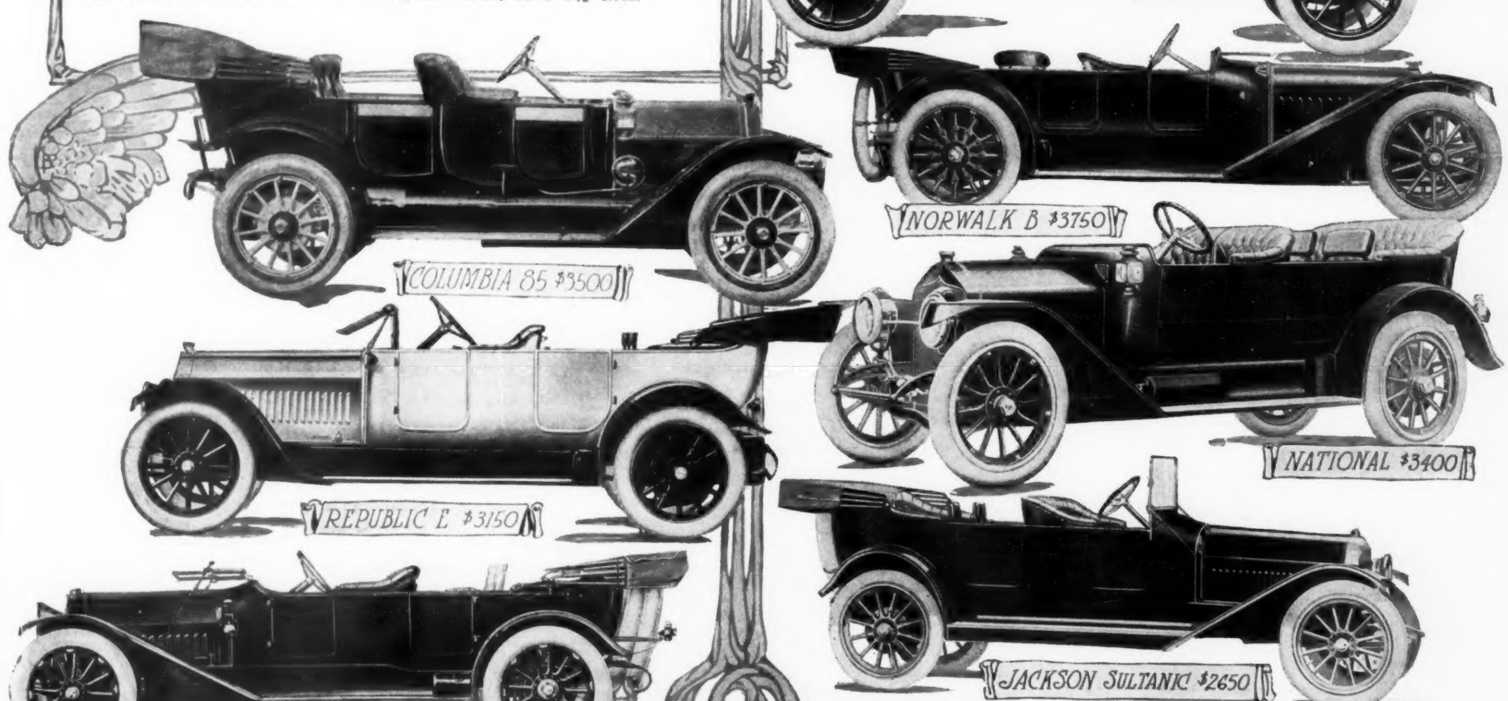


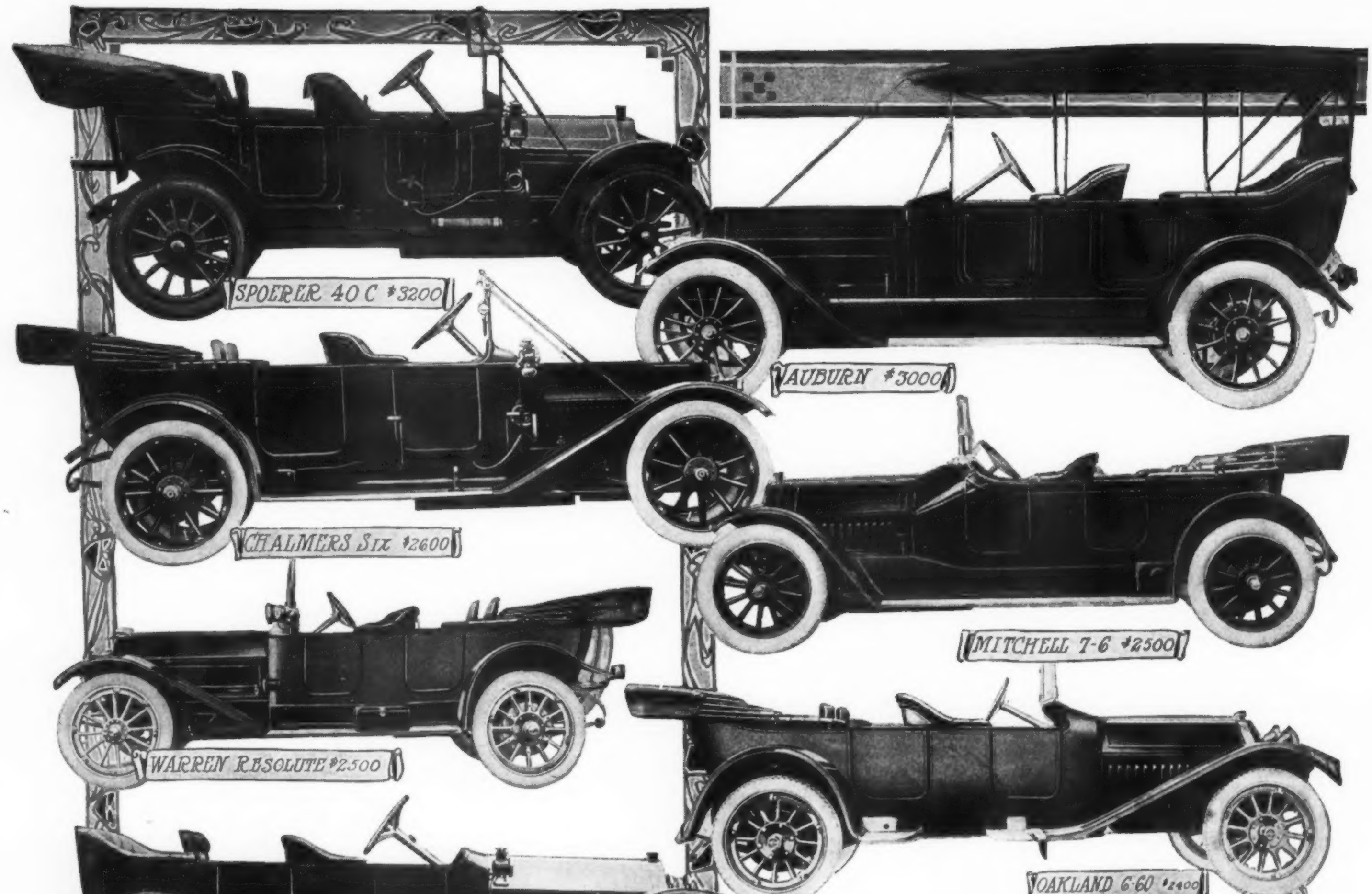
Medium Priced Open Cars Carrying Seven

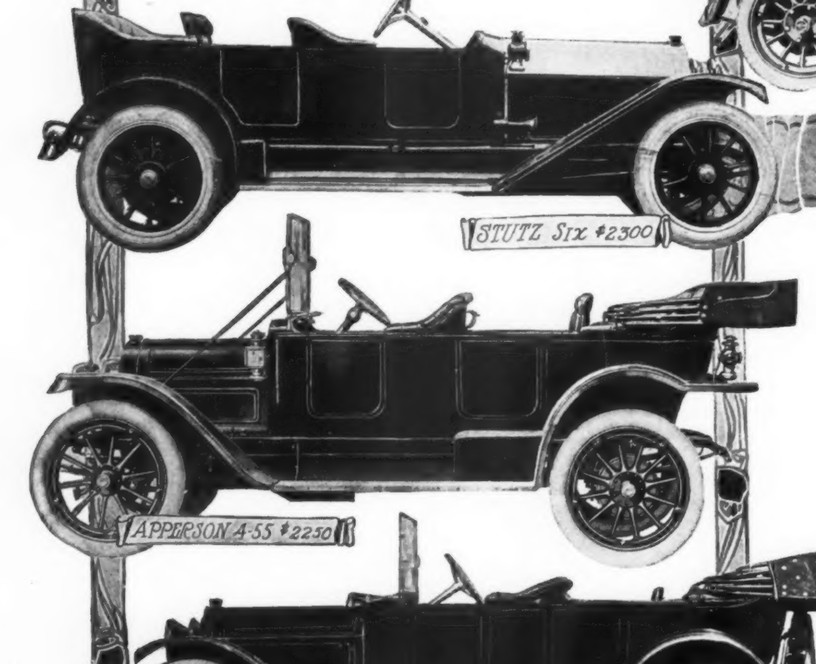
IMPROVEMENTS in the line of big touring cars are lengthened wheelbases; longer, easier springs, and in a number of cases the installation of a second windshield on the back of the driver's seat. Of course, the cars of this class partake of the general improvements that have been made. So far, no manufacturer of seven-passenger cars has invaded the $1,000 class. Two companies in the $1,500 class put out a seven-passenger car in 1912, the Pratt and Rambler, but the prices were much higher. The others are entirely new in the class.

Matheson C, $4,800. 48.6 H.P., 135 W.B., 37 x 5 tires.
Firestone-Columbus 60-E. 32.4 H.P., 122 W.B., 36 x 4 tires.
Stevens-Duryea C, $4,750. 46.1 H.P., 138 W.B., 36 x 4½ and 37 x 5 tires.
Pope-Hartford 29, $4,250. 46.1 H.P., 133 W.B., 37 x 5 tires.
American Traveler, $4,500. 46 H.P., 140 W.B., 41 x 4½ tires.
Franklin H, $3,750. 38.4 H.P., 126 W.B., 37 x 5 tires.
Columbia 85, $3,500. 38 H.P., 120 W.B., 36 x 4½ tires.
Norwalk B, $3,750. 43.8 H.P., 144 W.B., 41 x 5 tires.
Republic E, $3,150. 43.8 H.P., 132 W.B., 36 x 4½ tires
National V, $3,400. 38 H.P., 128 W.B., 36 x 5 tires.
Kisselkar 6-60, $3,150. 48.6 H.P., 140 W.B., 37 x 5 tires.
Jackson Sultanic, $2,650. 40.9 H.P., 138 W.B., 36 x 4½ tires.





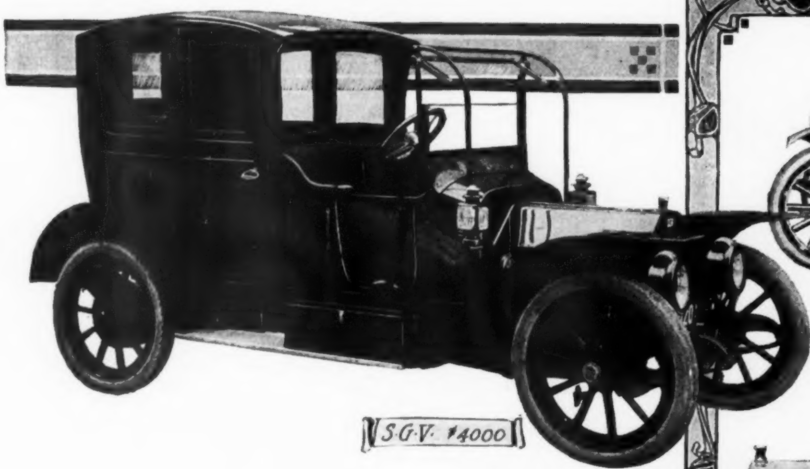




Low Priced Touring Cars

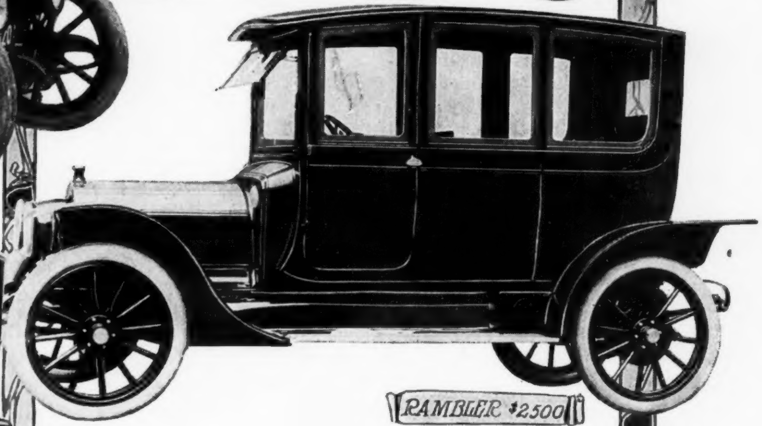
EVEN with full consideration of the multiplicity of models put out last year on account of duplications due to the introduction of foredoors, a view of the $2,500 class shows the immense advance that has been made. There are thirty-one models in the 1913 collection against twenty-five in 1912. The accessions to the class number the A. E. C., Alpena, Auburn, Burg, Carroll, Chevrolet, Croxton, Duquesne, Garford, Great Western, Holly, Hudson, Keeton, Moyer, Norwalk, Nyberg, Pilot, Pope-Hartford, Premier, Schacht, Studebaker, Touraine and Warren. Several of these companies are just entering business.

Spoerer, 40C, $3,200. 38 H.P., 120 W.B., 37 x 4½ tires.
Auburn 6-50, $3,000. 40.9 H.P., 135 W.B., 37 x 4½ tires.
Chalmers Six, $2,600. 43.8 H.P., 130 W.B., 36 x 4¼ tires.
Mitchell 7-6, $2,500. 43.8 H.P., 144 W.B., 36 x 4½ tires.
Warren Resolute, five passengers, $2,500. 38.4 H.P., 130 W.B., 36 x 4½ tires.
Oakland 6-60, five passengers, $2,400. 40.9 H.P., 130 W.B., 34 x 4½ tires.
Stutz 6, six passengers, $2,300. 43.8 H.P., 130 W.B., 34 x 4½ tires.
Apperson 4-55, seven passengers, $2,250. 36.1 H.P., 122 W.B., 36 x 4½ tires.
Flanders 50, seven passengers, $2,250. 38.4 H.P., 130 W.B., 36 x 4½ tires.
Patterson 47, $1,985. 32.4 H.P., 122 W.B., 36 x 4 tires.

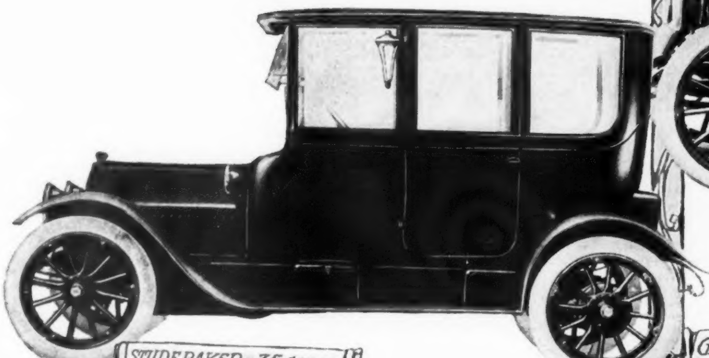


S·G·V· $4000

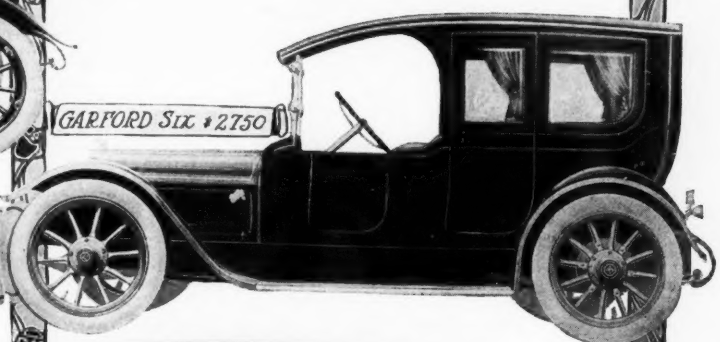
GREAT WESTERN $2250



RAMBLER $2500



STUDEBAKER 35 $2050



GARFORD SIX $2750

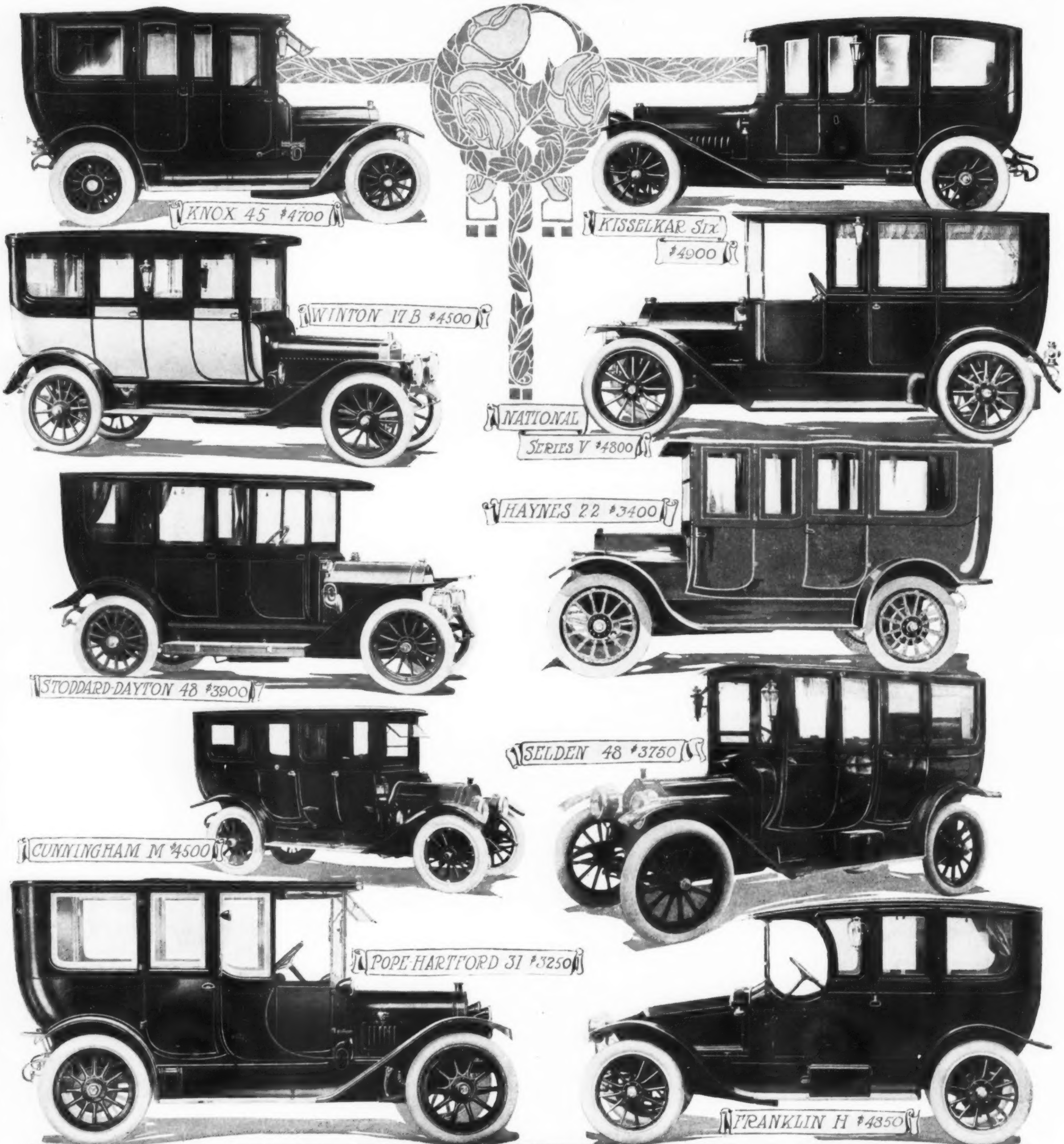
CARTERCAR D $2000

PAIGE $1600

New Compartment Bodies

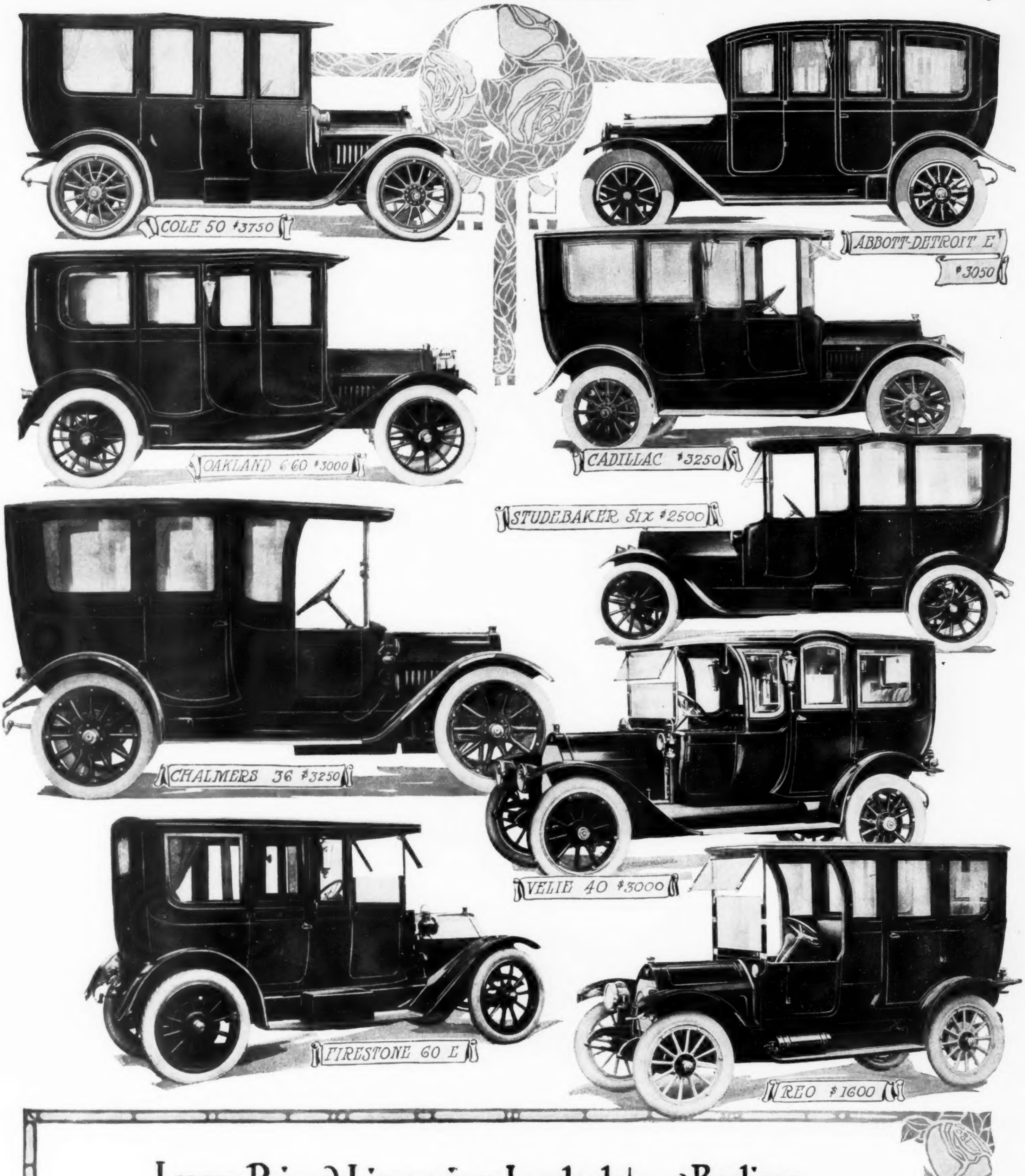
SINGLE-compartment cars constitute one of the main variations from the formal types of inclosed bodies. These cars are so arranged that the driver is not separated from the other passengers. On some there is but a single door at one side, whereas others have a door on each side in staggered relation to each other. The driver's seat is generally an arm-chair type, and that of the passenger at his side usually a revolving or folding-chair type. The cars differ little in other respects from the established types. The idea involved in this style of body is to reduce the distinction between driver and passengers to such an extent that the owner of the car may figure as driver if it should be desirable for him to do so or the chauffeur may be used as in other inclosed types by simply raising a glass partition. In the high-priced class the equipment is fuller than ever before. Electric cigar lighters, special fittings for flower vases and other refinements have become very frequent.

S.G.V., seven-passenger landaulet, $4,000. 25.6 H.P., 118 W.B., 35 x 4½ tires.
Great Western, Sedan, four passengers, $2.250. 28.9 H.P., 118 W.B., 36 x 4 tires.
Studebaker 35, five-passenger sedan, $2.050. 27.25 H.P., 115½ W.B., 34 x 4 tires.
Rambler, five-passenger limousine, $2,500. 32.4 H.P., 120 W.B., 37 x 4½ tires.
Garford G, four-passenger compartment, $2.750. 33.75 H.P., 128 W.B., 36 x 4½ tires.
Cartercar D, five-passenger sedan, $2,000. 27.25 H.P., 116 W.B., 36 x 4 tires.
Paige, five-passenger compartment, $1,600. 25.6 H.P., 116 W.B., 34 x 4 tires.



Enclosed Cars Seating Five or More Passengers

Knox 45, seven passenger, price $4,700. 40 H.P., 126 W.B., 37 x 5 tires.
Kisselkar 60, seven passenger, $4,900. 48.6 H.P., 140 W.B., 37 x 5 tires.
Winton 17D, seven passenger, $4,500. 48.6 H.P., 130 W.B., 36 x 4½ tires.
National V, seven passenger, $4,800. 38 H.P., 128 W.B., 36 x 5 tires.
Stoddard-Dayton 48, seven passenger, $3,900. 36.1 H.P., 122½ W.B., 36 x 4½ tires.
Haynes 22, seven passenger, $3,400. 32.4 H.P., 120 W.B., 36 x 4½ tires.
Cunningham M, seven passenger, $4,500. 36.1 H.P., 124 W.B., 36 x 4½ tires.
Selden 48. seven passenger, $3,750. 36.1 H.P., 125 W.B., 37 x 4½ tires.
Pope-Hartford 31, five passenger, $3,250. 30.25 H.P., 118½ W.B., 36 x 4½ tires.
Franklin H, seven passenger, $4,850. 38.4 H.P., 126 W.B., 37 x 5 tires.



Lower Priced Limousines, Landaulets and Berlines

Cole 50, seven passenger, $3,750. 40.9 H.P., 132 W.B., 37 x 4½ tires.
Abbott-Detroit E, seven passenger, $3050. 32.4 H.P., 121 W.B., 36 by 4½ tires.
Oakland 6-60, seven passenger, $3,000. 40.9 H.P., 130 W.B., 34 x 4½ tires.
Cadillac, seven passenger, $3,250. 32.4 H.P., 120 W.B., 36 x 4½ tires
Studebaker, seven passenger, $2,500. 20.4 H.P., 121 W.B., 34 x 4 tires.

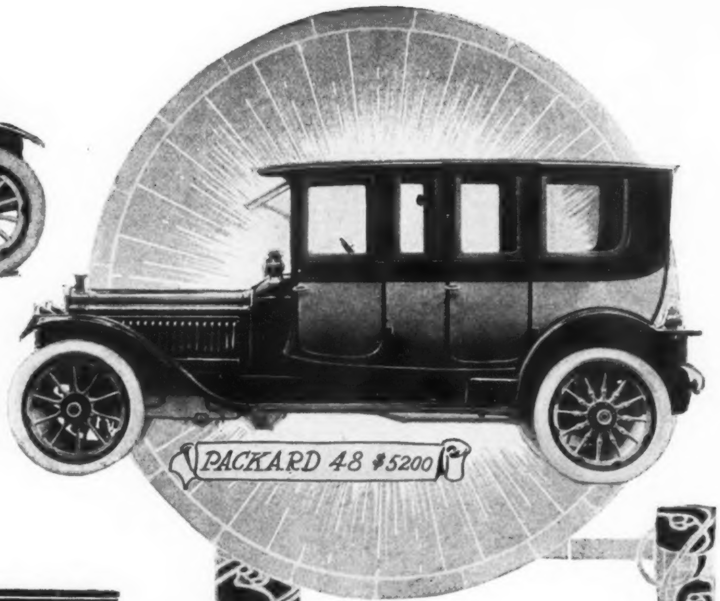
Chalmers 17, seven passenger, $3,250. 28.9 H.P., 118 W.B., 37 x 4½ tires.

Velie 40, five passenger, $3,000. 32.4 H.P., 118 W.B., 36 x 4 tires.

Firestone-Columbus, 60-E, seven passenger, 32.4 H.P., 122 W.B., 32 x 4 and 36 x 4 tires.

Reo 5, seven passenger, $1,600. 25.6 H. P., 112 W.B., 34 x 4 tires.

SIMPLEX 38 $6500

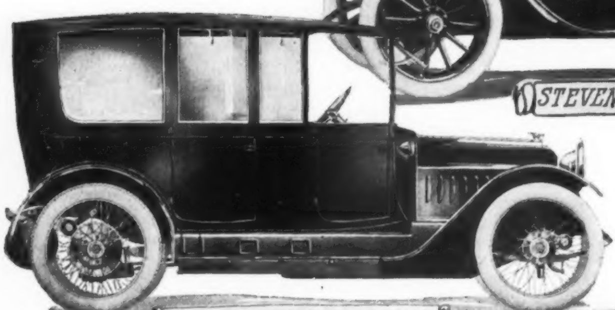


PACKARD 48 $5200

LOCOMOBILE R $5350

STEARNS-KNIGHT 4 $5000

STEVENS-DURYEA C $5500



EDWARDS-KNIGHT 25 $4600

WHITE SIX G.F. $6300

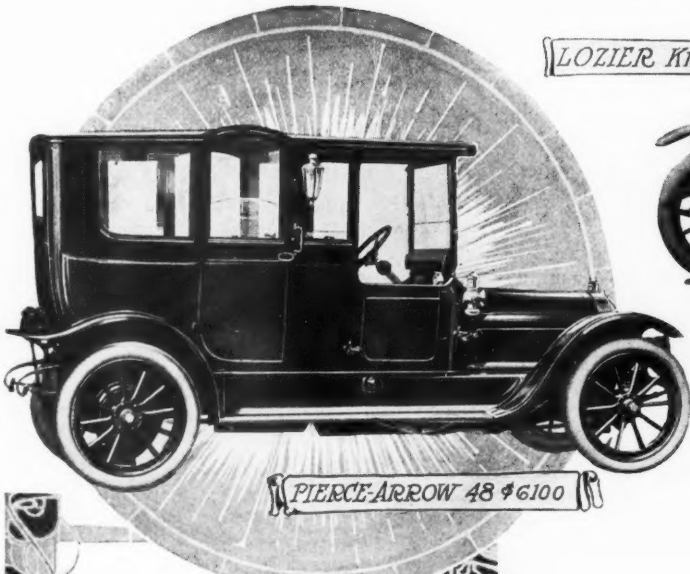
Enclosed Cars of Larger Capacity

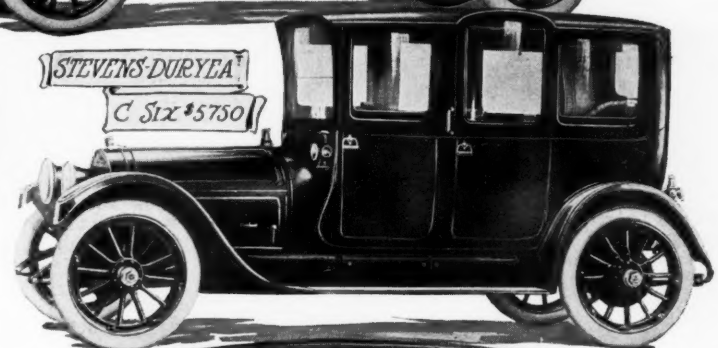
THE entire field of the closed car has been subjected to the same changes and improvements that have been noted with regard to other current automobiles.

Much has been said in favor of the curved roof, bending down in front and having a tendency to limit the perpendicular range of vision. This idea has been adopted in modified form and has been incorporated pretty generally throughout the industry in conjunction with larger side windows. Extreme types embodying the idea of colonial coach-building are to be seen, but the straight-topped car, with enough flare and curved outlines in the lower portion of the body to get away from the freight car appearance of earlier years, is still a popular standard type.

There is a marked tendency to shorten the projecting roof over the driver's seat in broughams and towncars, but in the limousine and landaulet models the projection is carried out beyond the windshield. Electric lamps built into the bodies the surface being flush with the lines of the car are widely used.

Simplex 38, seven passengers, $6,500. 38 H.P., 137 W.B., 35 x 5 tires.
Packard 48, seven passengers, $5,200. 48.6 H.P., 139 W.B., 36 x 4½ and 37 x 5 tires.
Locomobile R, seven passengers, $5,350. 43.8 H.P., 128 W.B., 36 x 4½ tires.
Stearns-Knight 4, five passengers, $5,000. 28.9 H.P., 121 W.B., 36 x 4½ tires.
Stevens-Duryea C, seven passengers, $5,500. 46.1 H.P., 131 W.B., 37 x 4½ and 37 x 5 tires.
Edwards-Knight 25, seven passengers, $4,600. 25.6 H.P., 120 W.B., 36 x 4½ tires.
White GF, seven passengers, $6,300. 43.8 H.P., 132 W.B., 37 x 5 tires.



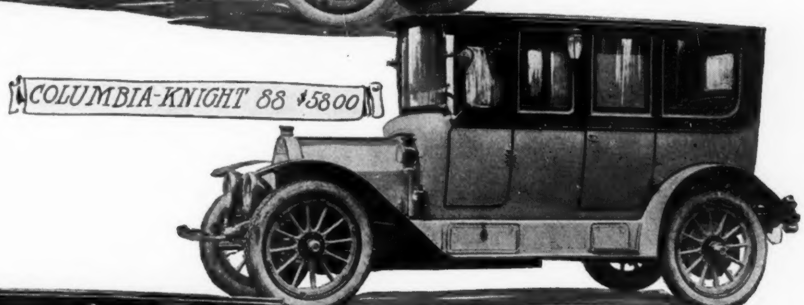


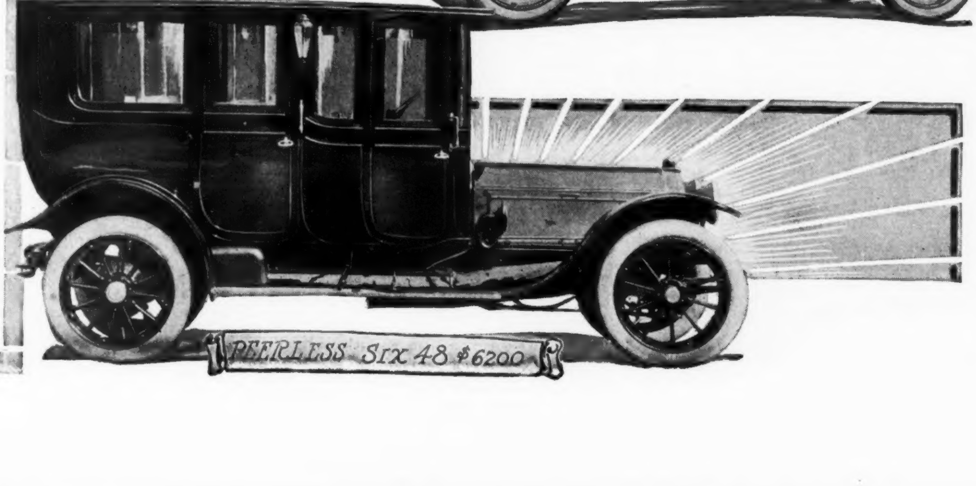
Limousines and Landaulets

IN the closed-car types, having passenger capacity of from five to ten persons many models have been eliminated in the class selling for over $3,000. Statistics show that the market affords a choice of only 154 models, while last year there were thirty more. Four more models have been added to the $2,000-$3,000 class, making a total of fourteen, and the net loss in the high-priced line is thirty-five. The addition of the single offering in the $1,250-$2,000 class makes the total count 154 for 1913 against 184 for 1912.

The sedan, an enlargement of the coupé idea but seating five or six passengers, is the distinctive feature of the year. Limousines, landaulets, berlines, broughams and towncars are included in the classification generally and are continued in somewhat reduced numbers by all the manufacturers in active manufacturing who made them last year.

Passenger compartments are larger, lower and better balanced than heretofore. The softening of angles is a well-nigh universal tendency. One concern puts out two limousine models with a carrying capacity of ten persons each.





Pierce-Arrow 48D, seven passengers, $6,100. 48.6 H.P., 134½ W.B., 37 x 5 tires.
Lozier Knickerbocker, seven passengers, $6,500. 51.6 H.P., 131 W.B., 36 x 4½ and 37 x 5 tires.
Stevens-Duryea C, seven passengers, $5,750. 46.1 H.P., 138 W.B., 37 x 4½ and 37 x 5 tires.
Simplex 137, seven passengers, $6,500. 38 H.P., 137 W.B., 35 x 5 tires.
Packard 38, seven passengers, $5,400. 38.4 H.P., 134 W.B., 36 x 4½ and 37 x 5 tires.
Columbia Knight 88, seven passengers, $5,800. 38 H.P., 129 W.B., 36 x 4½ tires.
Peerless 36, seven passenger, $6,200. 48.6 H.P., 137 W.B., 36 x 4½ and 37 x 5 tires.

Runabouts Listed at $1500 to $2000

AS indicated so strongly last year, the tendency toward storing the spare tires at the rear, either upon the flat or sloping deck or in holders at the extreme end, has been developed and adopted by almost every maker.

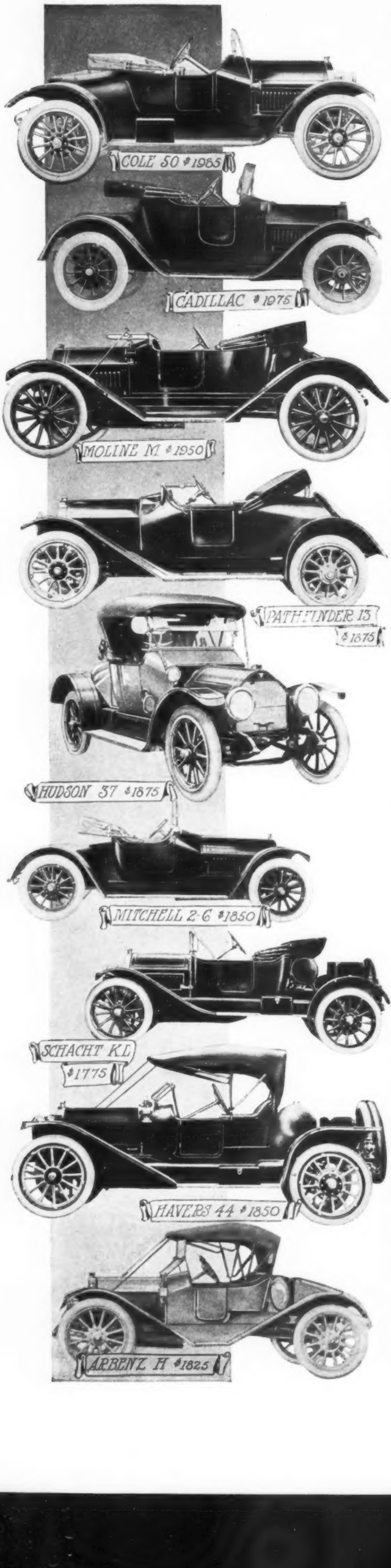
In appearance the 1913 runabout is more graceful. Its running boards are clear from one end of the division to the other. Tool boxes are built flush with the sides; tire-carriers have been eliminated from the boards; gas tanks are no longer omnipresent, quite the contrary in fact, although some are still to be seen.

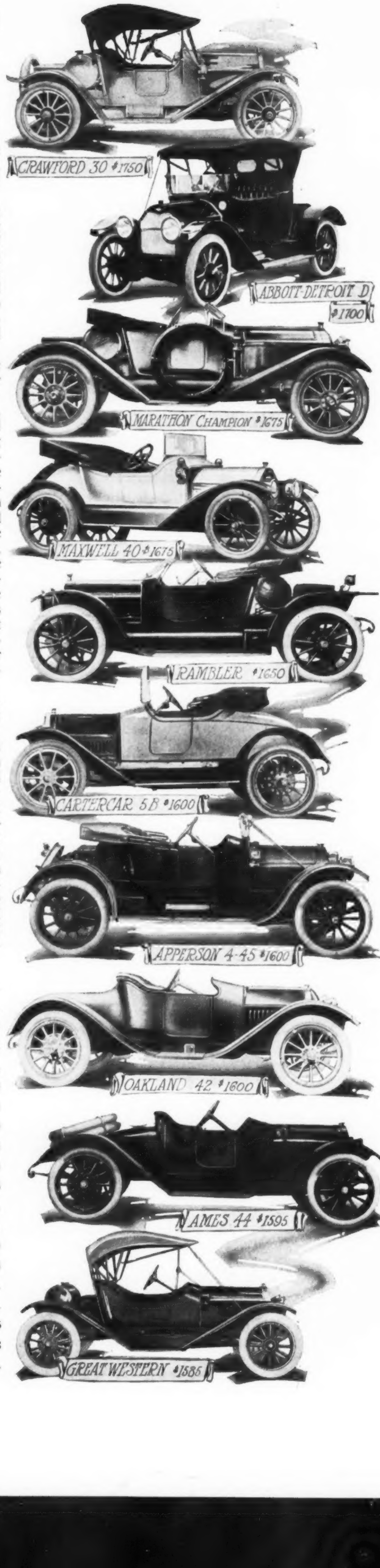
In facilities for distance work the runabout is far in advance of other years. In almost all of the models, except a few of the smallest variety, special facilities have been supplied for touring. Comfortable seating is one of the elements; larger gasoline storage is another; adequate baggage capacity is still another essential that has been worked out in the current line. The seating and gasoline tanks are details but the baggage carrying is an improvement. In a considerable majority of the cars listed at and above $1,250, provision is made for carrying baggage on the rear deck. This idea is worked out in a variety of ways but the favorite seems to be the compartment, which may be utilized for tire carrying or for the accommodation of a small trunk or suit cases.

The idea of touring in a high-powered runabout is one that is growing steadily.

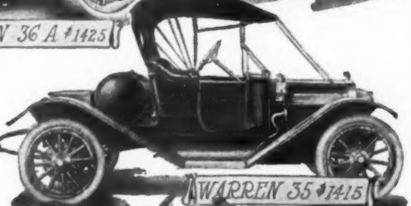
Mechanically the changes of 1913 are of small importance although rather large in number. The general adoption of electric lighting and the large installation of electric starting devices have resulted in the elimination of battery boxes on the running board and led to their suspension on the frame beneath the body. This has caused a number of rearrangements in the mechanical parts of the automobile. The same may be said for the adoption of central control with its tendency to shorten the leftward reach of the levers.

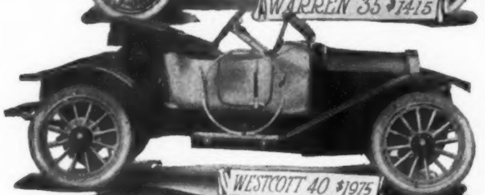
Cole 50, two passengers, $1,985. 32.4 H.P., 122 WB., 36 x 4 tires.
Cadillac, two passengers, $1,975. 32.4 H.P., 120 WB., 36 x 4½ tires.
Moline M, two passengers, $1,950. 27.25 H.P., 115 WB., 34 x 4 tires.
Pathfinder 13, two passengers, $1,875. 27.25 H.P., 120 WB., 36 x 4 tires.
Hudson 37, two passengers, $1,875. 27.25 H.P., 118 WB., 36 x 4 tires.
Mitchell 2-6, two passengers, $1,850. 33 H.P., 132 WB., 36 x 4 tires.
Schacht KL, two passengers, $1,775. 28.9 H.P., 120 WB., 36 x 4 tires.
Havers 44, two passengers, $1,850. 33.75 H.P., 122 WB., 36 x 4 tires.
Arbenz H, two passengers, $1,825. 27.3 H.P., 120 WB., 36 by 4 tires.
Crawford 30, two passengers, $1,750. 27.25 H.P., 115 WB., 34 x 4 tires.
Abbott-Detroit D, two passengers, $1,700. 27.3 H.P., 116 WB., 34 x 4 tires.
Marathon Champion, two passengers, $1,675. 32.4 H.P., 123 WB., 36 x 4 tires.
Maxwell 40, two passengers, $1,675. 28.9 H.P., 115 WB., 36 x 4 tires.
Rambler, two passengers, $1,650. 32.4 H.P., 120 WB., 36 x 4 tires.
Cartercar 5B, two passengers, price $1,600. 27.25 H.P., 116 WB., 36 x 4 tires.
Apperson 4-45, two passengers, $1,600. 32.4 H.P., 114 WB., 34 x 4 tires.
Oakland 42, three passengers, $1,600. 27.25 H.P., 116 WB., 34 x 4 tires.
Ames 44, two passengers, $1,595. 27.3 H.P., 118 WB., 36 x 4 tires.
Great Western, two passengers, $1,585. 28.9 H.P., 118 WB., 36 x 4 tires.

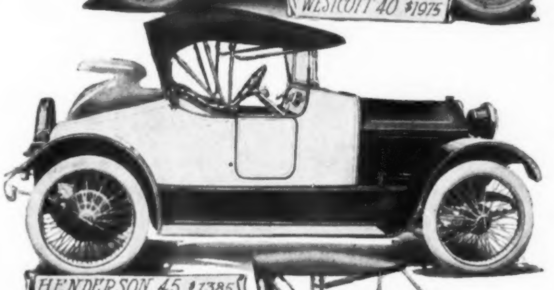


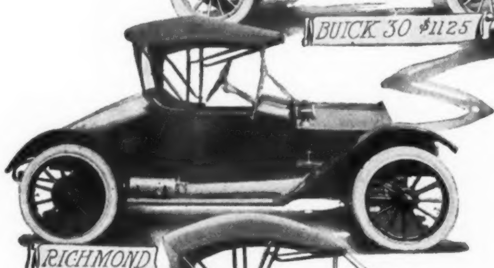


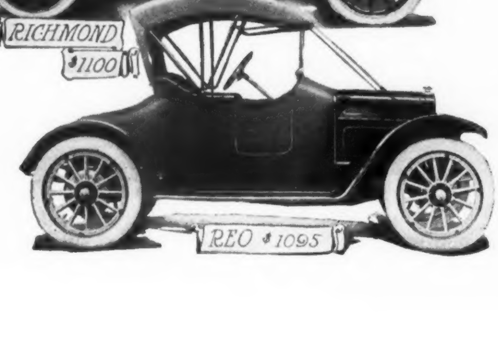
Low Priced Roadsters and Runabouts











DESPITE the fact that wheelbases in the high-priced class are generally longer than last year, the tendency noted hitherto to bring back the motor and place the radiator nearly on a line with the front axle has made little progress.

In average price there has been an advance. While the list price of most of the models is little higher than last year the marked decrease in the number of cheaper cars, the transfer of a few makers of their runabout models from lower to higher-priced classes and the steady price trend noted in the high-priced class, account for the difference.

More equipment is furnished all around than last year and as a general proposition it may be said that the buyer receives more for the same money than he did last year and that in such a view of the industry, prices have actually declined.

In the line of three-passenger, open-bodied cars, 1913 and 1912 stand on the same basis so far as the number of models presented are concerned. There are twenty-three in the 1913 offering and the same number were presented last year. The standard companies in the high-priced class are continuing their models of this type, except that the new cars contain the various detail developments noted elsewhere in the industry as typical of 1913.

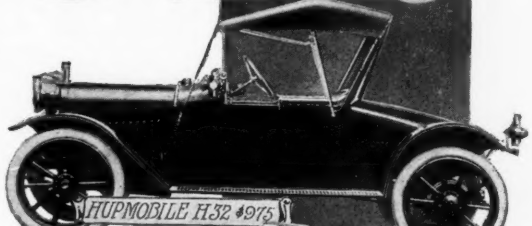
In the medium classes much the same condition obtains, but in the low priced class there have been numerous changes. Four companies that included a three-passenger model in 1912 are not presenting one this year, while four new companies have taken their place in the ranks of this class.

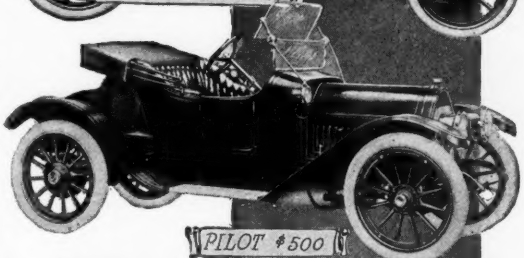
The withdrawals and additions in the higher classes about counterbalance.

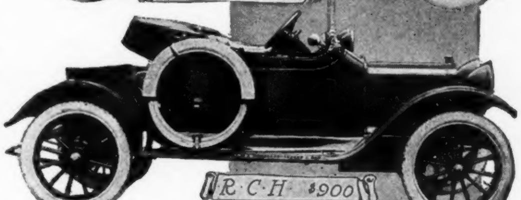
The three-passenger idea is worked out in several ways. These include the addition of a rumble seat, side seat and the widening of the body to accommodate three sitting abreast.

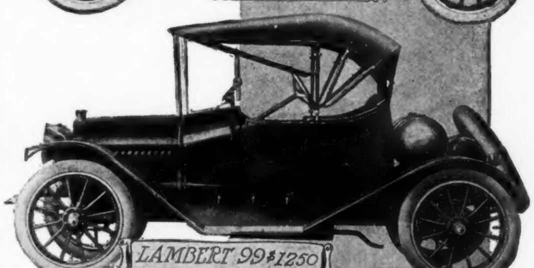
To a greater extent than applies to any other class of automobile building, the three-passenger type appeals to newcomers, but continued patronage is shown distinctly by the fact that the standard companies retain these models practically unchanged from year to year.

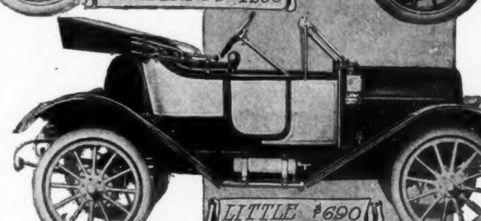
Pullman, two passengers, $1,675. 26.4 H.P., 118 W.B., 34 x 4 tires.
Cutting A-40, two passengers, $1,475. 25.6 H.P., 120 W.B., 36 x 4 tires.
Marion 36-A, two passengers, $1,425. 25.6 H.P., 112 W.B., 34 x 4 tires.
Warren 35, two passengers, $1,415. 27.25 H.P., 110 W.B., 36 x 4 tires.
Westcott 40, two passengers, $1,975. 32.4 H.P., 120 W.B., 36 x 4 tires.
Henderson 45, two passengers, $1,385. 27.25 H.P., 116 W.B., 34 x 4 tires.
Buick 30, two passengers, $1,125. 25.6 H.P., 108 W.B., 34 x 4 tires.
Richmond O, two passengers, $1,100. 25.6 H.P., 112 W.B., 34 x 3½ tires.
Reo 5, two passengers, $1,095. 25.6 H.P., 112 W.B., 34 x 4 tires.
Overland 69, two passengers, $985. 25.6 H.P., 110 W.B., 32 x 3½ tires.
Hupmobile H32, two passengers, $975. 16.9 H.P., 106 W.B., 32 x 3½ tires.
Pilot, two passengers, $500.
Regal N, two passengers, $900. 22.5 H.P., 108 W.B., 32 x 3½ tires.
R.C.H., two passengers, $900. 16.9 H.P., 110 W.B., 32 x 3½ tires.
Lambert 99, two passengers, $1,250. 28.9 H.P., 117 W.B., 34 x 3½ tires.
Little, two passengers, $690. 19.6 H.P., 90 W.B., 30 x 3½ tires.
Metz, two passengers, $495. 22.5 H.P., 90 W.B., 30 x 3 tires.

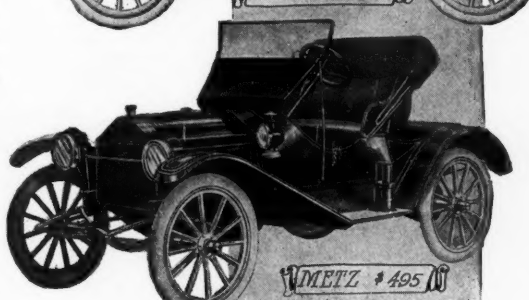




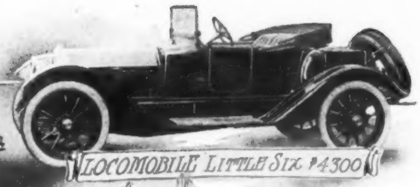


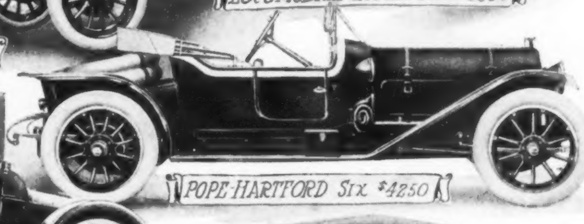


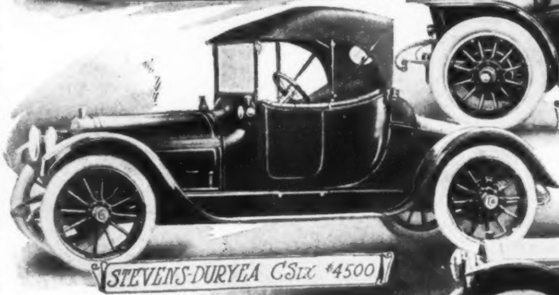


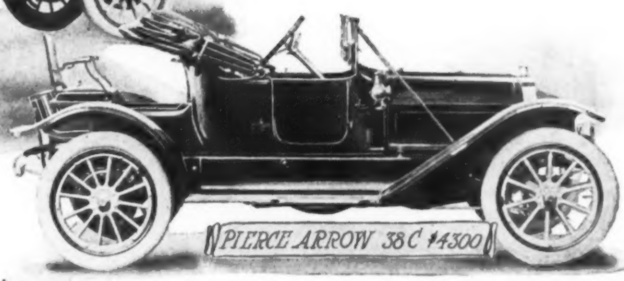


Two Passenger Cars - $3000 and over -





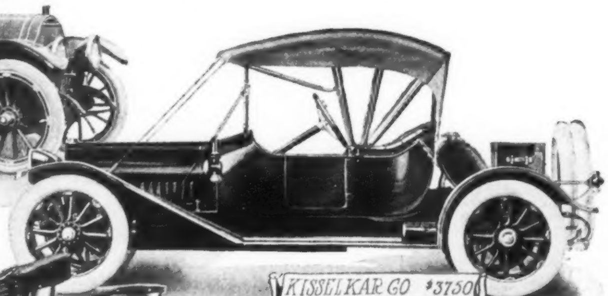


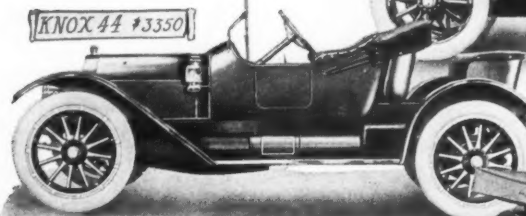


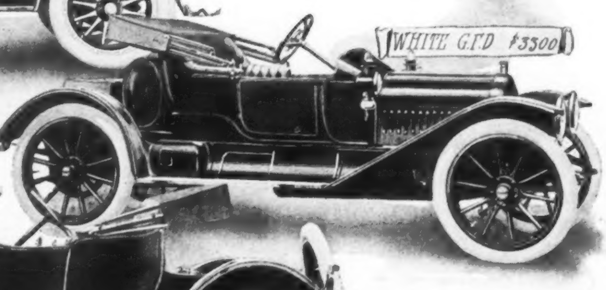
MUSHROOM companies that at an earlier period of the industry sprang up in a night, almost invariably put out two or more runabouts and when the financial blight overtook them for any one of a dozen excellent reasons, the subsequent tabulations of the industry showed the absence of their models. In the 1912 season twenty-six companies retired, accounting for a gross loss of seventy-eight models in the runabout class. At the same time thirteen new makers entered the lists with twenty-three models. On the face of the reports this shows a net loss of fifty-five models but the difference is made up by the weeding and adjustment of the list.

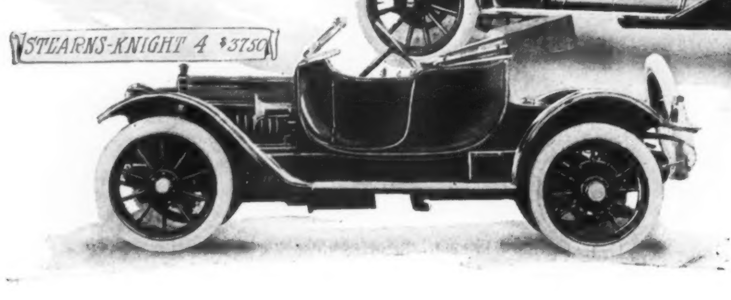
Almost all of the losses in the runabout class were scored in the highest and lowest price divisions. In the low class the losses were caused largely by retirements from business; in the upper class by the elimination of models. In the two middle classes, namely: from $1,251 to $2,000 and from $2,001 to $3,000 the net loss was only eight models. This indicates on even broader lines the tendency toward centralization.

The differences between the runabout of 1913 and its predecessors are mostly developments of innovations introduced in 1912 and earlier in the industry. Inside control is all but universal, although there is still a wide difference in design as to the location of the control levers. A central position for the levers has advanced in favor and is to be seen in a very large percentage of the cars offered. Many models are made with control at the right side and in a few cases the control is at the left side of the car. Left side drive has been adopted quite generally.







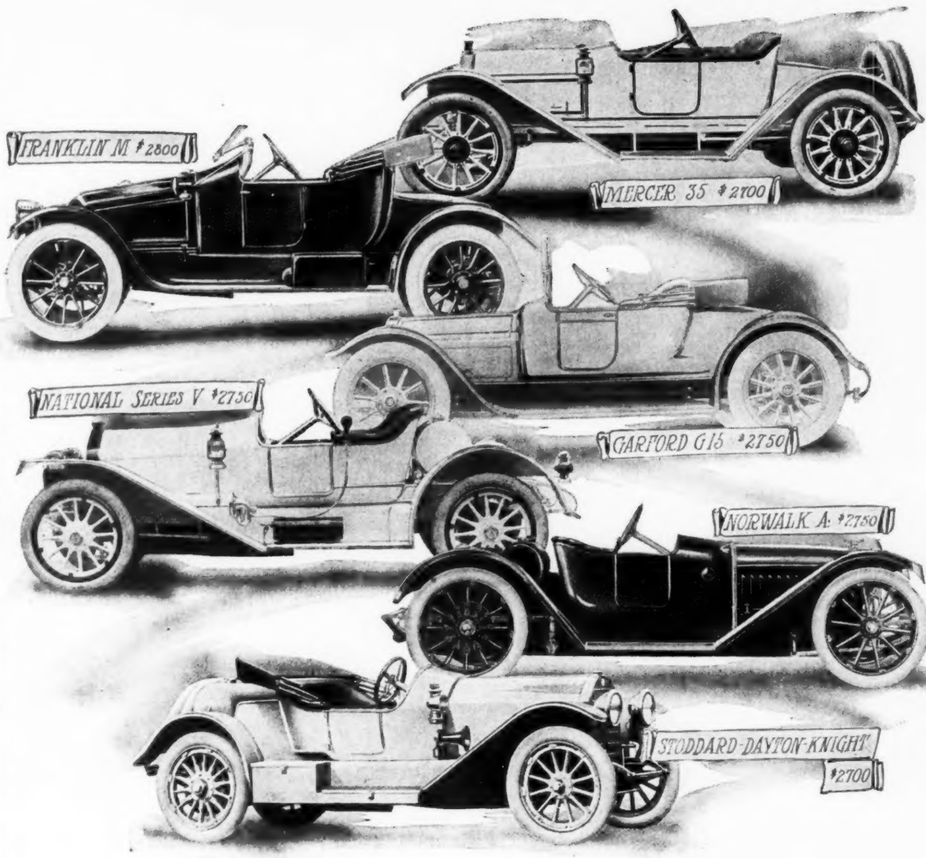


Electric lights are practically universal. Some sort of an engine starter has been installed in nearly all the medium and high-priced cars. The starters are generally electric but there are also gas and pneumatic types.

The cowl is deeper in most models and the streamline effect, so much sought after in body design, is emphasized by the improvement of the cowl this year. Two practical purposes are served, in the first place it protects the instruments on the dash and second, it affords opportunity to install forward gasoline storage which has been accepted by a number of manufacturers.

Cunningham M, three passengers, $3,250. 36.1 H.P., 124 W.B., 36 x 4½ tires.
Kisselkar 60, two passengers, $3,750. 48.6 H.P., 140 W.B., 37 x 5 tires.
Knox 44, four passengers, $3,350. 50 H.P. 122 W.B., 36 x 4½ tires.
White G.F.D., two passengers, $3,300. 28.9 H.P., 120 W.B., 36 x 4½ tires.
Stearns-Knight 4, three passengers, $3,750. 28.9 H.P., 116 W.B., 36 x 4½ tires.
Lozier Meadowbrook, two passengers, $5,000. 51.6 H.P., 131 W.B., 36 x 4½ and 37 x 5 tires.
Locomobile R, two passengers, $4,300. 43.8 H.P., 128 W.B., 36 x 4½ tires.
Stevens-Duryea C, two passengers, $4,500. 46.1 H.P., 131 W.B., 37 x 4½ tires.
Pope-Hartford 29, two passengers, $4,250. 46.1 H.P., 133 W.B., 37 x 5 tires.
Peerless 38, three passengers, $4,300. 38.4 H.P., 125 W.B., 36 x 4½ tires.
Packard 38, three passengers, $4,050. 38.4 H.P., 115½ W.B., 36 x 4½ and 37 x 5 tires.
Pierce-Arrow 38C, three passengers, $4,300. 38.4 H.P., 132 W.B., 36 x 4½ tires.

Runabouts and Roadsters - from \$2000 to \$3000 -



ROADSTERS or runabouts with seating capacity for two passengers are not presented in such large numbers this year as they were in 1912. The current offerings of the American automobile industry consist of 224 models while last year 276 were on the market.

The reasons for this decline in the roadster type are mainly, the universal tendency toward centralizing manufacturing and selling effort upon a single chassis size, and the retirement from the field of a number of makers whose product consisted largely of two-passenger open-bodied cars.

Dividing the industry into four groups or sections marked out by the selling prices of the runabouts, it will be found that in the class listing at \$1,250 and under there are only thirty-three models presented, against sixty-three last year.

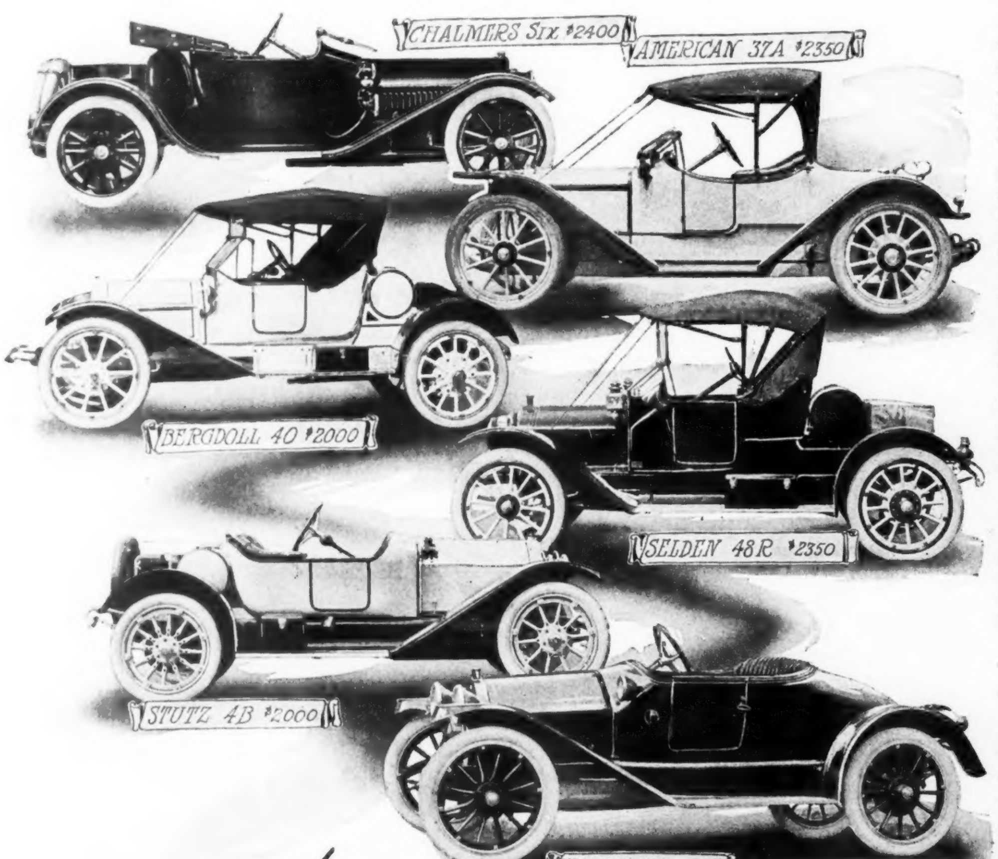
In the class selling from \$1,251 to \$2,000, there is a net gain of one model, the tables showing seventy-four for 1913 and seventy-three for 1912.

In the \$2,001-\$3,000 class there are eighty-seven this year and there were ninety-six last year.

Above \$3,000 there are thirty models of roadsters listed for 1913 while in 1912 the number was forty-four.

In the process of centralization the manufacturers have eliminated more than a score of models and the remainder are accounted for by retirement of former makers from the field. All told the net reduction amounts to fifty-two models as compared with last year, or a little less than 19 per cent.

The reduction in the number of models does not mean that this type of automobile has been discredited or has lost any popularity. It means only that where a company listed several runabouts last year, the same company is making only one or two types and centering its attention upon them. In a few instances well established companies have discontinued two-passenger open-bodied cars, but it will be found that in almost every instance of that kind the runabout business of the company was of small proportions and the scattering of forces required by a multiplicity of models was too high a price to pay for whatever advantage there may be in putting out a full line including all body types. The fact that quite a material number of those companies that dropped out during 1912, manufactured runabouts, is no reflection against the type.



Chalmers 18, two passengers, \$2,400. 43.8 H.P., 130 WB., 36 x 4½ tires.
American 37A, two passengers, \$2,350. 32.4 H.P., 118 WB., 37 x 4 tires.
Bergdoll 40, two passengers, \$2,000. 25.6 H.P., 121 WB., 36 x 4 tires.
Selden 48R, two passengers, \$2,350. 36.1 H.P., 125 WB., 36 x 4 tires.
Stutz 4B, two passengers, \$2,000. 36.1 H.P., 120 WB., 34 x 4½ tires.
Kline 40, two-passengers, \$2,250. 28.9 H.P., 118 WB., 36 by 4 tires.
Palmer & Singer, Brighton, two passengers, \$2,000. 38.4 H.P., 127 WB., 36 x 4 tires.
Mercer 35, two passengers, \$2,700. 30.63 H.P., 108 WB., 32 x 4 tires.
Franklin M, two passengers, \$2,800. 31.6 H.P., 116 WB., 34 x 4 tires.
Garford G15, two passengers, \$2,750. 33.75 H.P., 128 WB., 36 x 4½ tires.
National V, two passengers, \$2,750. 38 H.P., 120 WB., 36 x 4½ tires.
Norwalk A, two passengers, \$2,750. 38.4 H.P., 126 WB., 38 x 4½ tires.
Stoddard-Dayton Knight, two passengers, \$2,700. 36.1 H.P., 122½ WB., 36 x 4½ tires.

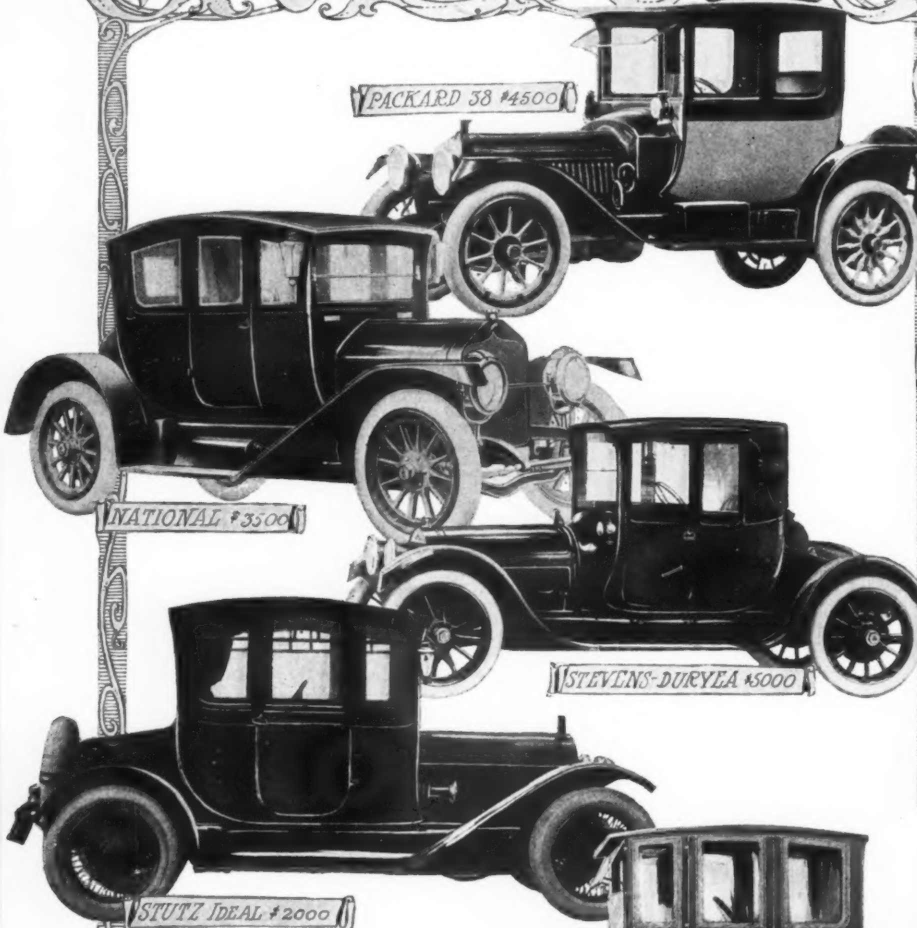
Coupes of Higher Price

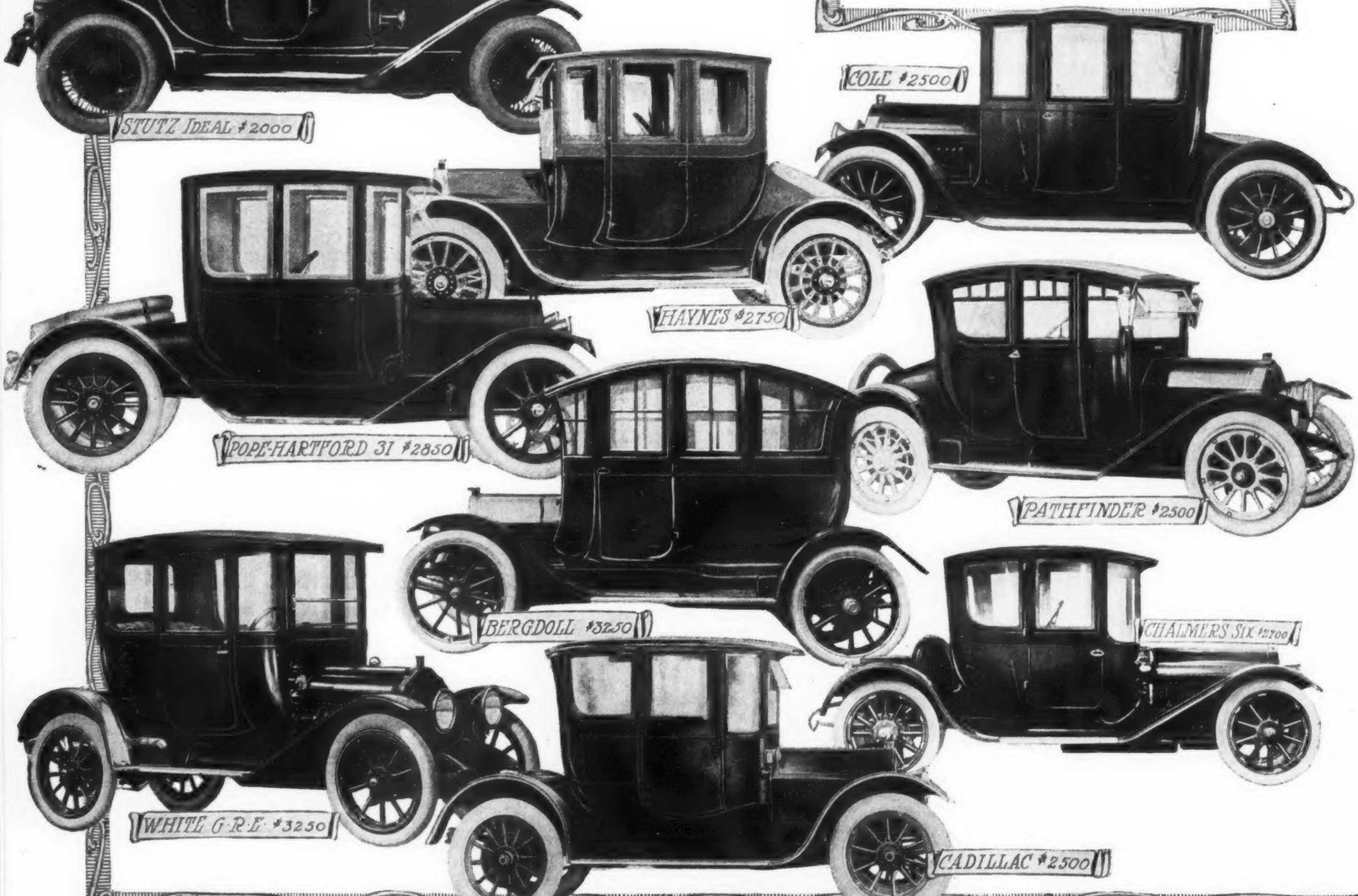
IN the coupé types one of the popular trends of the season is encountered.

The coupé will be one of the most important cars of 1913, as foreshadowed by the interest taken in it by the manufacturer.

For 1913 the industry presents fifty-two models and the $2,000-$3,000 class only shows a loss in the number of models.

Packard 38, $4,500. 38.4 H.P., 115½ W.B., 36 x 4½ and 37 x 5 tires.
National V, $3,500. 38 H.P., 128 W.B., 36 x 4½ tires.
Stevens-Duryea, $5,000. 46.1 H.P., 131 W.B., 37 x 4½ and 37 x 5 tires.
Stutz, $2,000. 36.1 H.P., 120 W.B., 34 x 4½ tires.
Cole, $2,500. 32.4 H.P., 122 W.B., 36 x 4 tires.
Haynes, $2,750. 32.4 H.P., 120 W.B., 36 x 4½ tires.
Pope-Hartford 31, $2,850. 30.1 H.P., 118½ W.B., 36 x 4½ tires.
Pathfinder 13, $2,500. 27.25 H.P., 120 W.B., 36 x 4 tires.
Bergdoll 40, $3,250. 25.6 H.P., 121 W.B., 36 x 4 tires.
White GRE, $3,250. 22.5 H.P., 110 W.B., 34 x 4 tires.
Cadillac, $2,500. 32.4 H.P., 120 W.B., 36 x 4½ tires.
Chalmers 18, $2,700. 43.8 H.P., 130 W.B., 36 x 4½ tires.

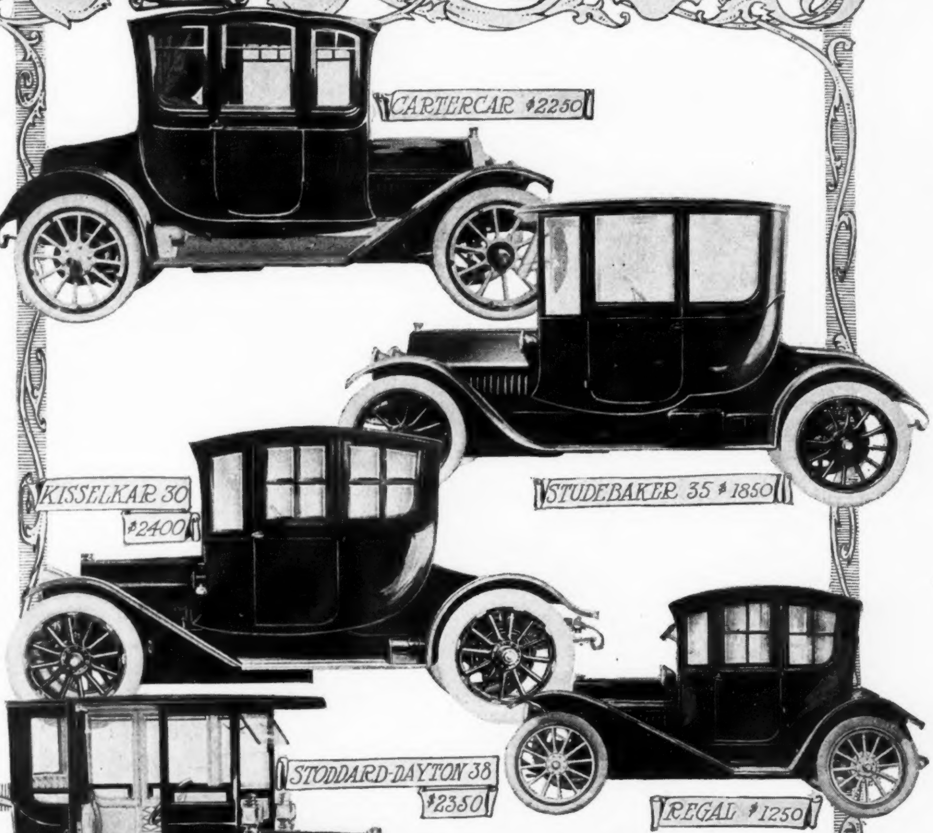


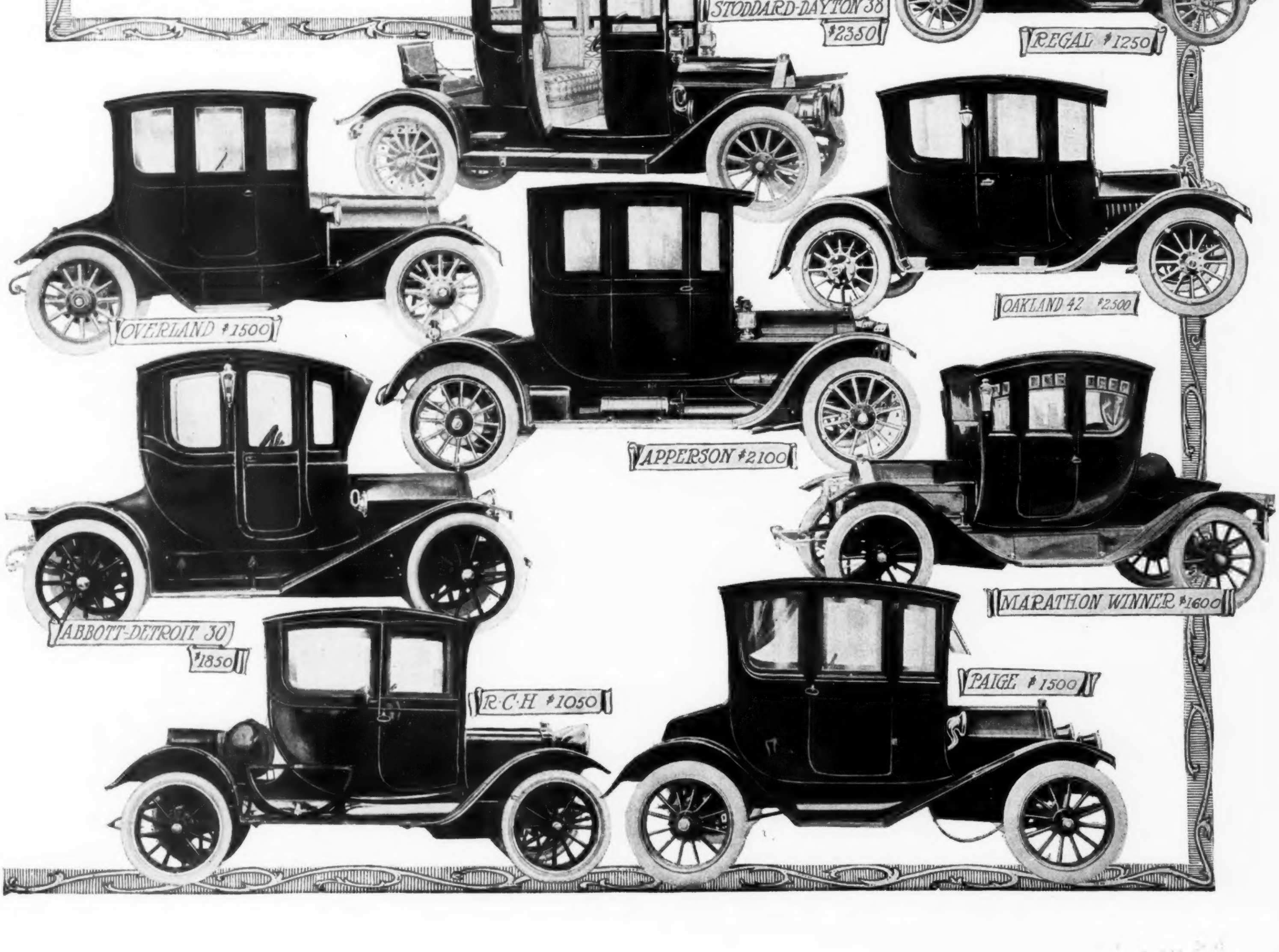


Medium Priced Coupes

IN the high-priced class the increase is remarkable, as in 1912 there were only four models of coupés offered, while this season the list contains nineteen models. In the $2,500 class the loss is more apparent than real, for included in its list are five sedan models, which are simple enlargements of the coupé types carried in 1912. In the $1,500 class a large increase is shown.

Cartercar 5, $2,250. 27.25 H.P., 116 W.B., 36 x 4 tires.
Studebaker 35, $1,850. 27.25 H.P., 115½ W.B., 34 x 4 tires.
Kisselkar, $2,400. 32.4 H.P., 121 W.B., 35 x 4½ and 35 x 4 tires.
Regal, $1,250. 22.5 H.P., 100 W.B., 32 x 3½ tires.
Stoddard-Dayton 38, $2,350. 28.9 H.P., 114 W.B., 35 x 4½ tires.
Overland 69, $1,500. 25.6 H.P., 110 W.B., 32 x 3½ tires.
Oakland 42, $2,500. 27.25 H.P., 116 W.B., 34 x 4 tires.
Apperson 4-45, $2,100. 32.4 H.P., 114 W.B., 34 x 4 tires.
Abbott-Detroit, $1,850. 27.3 H.P., 116 W.B., 34 x 4 tires.
Marathon Winner, $1,600. 28.9 H.P., 116 W.B., 34 x 4 tires.
R.C.H., $1,050. 16.9 H.P., 110 W.B., 32 x 3½ tires.
Paige, $1,500. 22.5 H.P., 110 W.B., 33 x 4 tires.





The Check Book and the Cars

Full Pocket-Book Class

Costing Over $3000

PROSPECTIVE purchasers of 1913 cars of high-class manufacture will be confronted with the products of no less than forty-eight factories, ranging in price between $3,000 and $7,250. These cars represent the cream of American automobile engineering, body building and equipment. Fully 360 models are offered to the public and almost one-fourth of these are limousine equipped, indicating the rapidly increasing degree in which this splendid type of body attracts automobilists and showing that comfort is among the chief requirements of an expensive car. Besides eighty-seven limousines there are fifty-eight seven-passenger touring cars, forty-one five-passenger touring cars, thirty-six roadsters and thirty-one landaulets; while the remainder of the body styles is made up by three- and four-passenger touring cars, broughams, phaetons, coupés, runabouts and a variety of so-called fancy styles.

Next to comfort, power is a leading consideration in selecting a quality automobile. The cars shown this year vary in horsepower from 60.50 to 25.60, these sizes referring to the five-cylinder Adams-Farwell and the new Edwards-Knight, respectively. The average horsepower of the high-priced 1913 car is 39.49.

(*Continued on page 102.*)

Automobiles Costing Over $3000

Name and Model	Body	Price	Seats	S.A.E. H.P.	Wheel-base	TIRES Front	TIRES Rear
Abbott-Detroit, E.	Limousine..	$3050	7	32.40	121	36x4½	36x4½
Adams-Farwell, 9.	Road.......	3000	5	60.50	120	36x4½	36x4½
Adams-Farwell, 9.	Tour.......	3500	7	60.50	120	36x4½	36x4½
A.E.C., 6-60......	Road.......	3000	2	48.60	138	37x5	37x5
A.E.C., 6-60......	Tour.......	3000	7	48.60	138	37x5	37x5
Alco, 7-16.......	Land.......	6750	6	24.90	104	32x4	32x4
Alco, 11-60......	Tour.......	6000	7	54.10	133½	36x4½	37x5
Alco, 11-60......	Tour.......	6000	5	54.10	133½	36x4½	37x5
Alco, 11-60......	Limousine..	6750	5	54.10	133½	36x4½	37x5
Alco, 11-60......	Berl........	7250	7	54.10	133½	36x4½	37x5
Amer. Trav., 54A..	Tour.......	4250	4	46.00	124	40x4	41x4½
Amer. Trav., 65A..	Tour.......	4500	6	46.00	140	41x4½	41x4½
Atlas, 12.........	Tour.......	3500	5	32.40	130	37x5	37x5
Atlas, 12.........	Tour.......	3700	7	32.40	130	37x5	37x5
Auburn, 6-50.....	Tour.......	3000	7	40.90	135	37x4½	37x4½
Bergdoll, 40......	Limousine..	3250	7	25.60	121	36x4	36x4
Bergdoll, 40......	Coupe......	3250	4	25.60	121	36x4	36x4
Cadillac, 1913....	Limousine..	3250	7	32.40	120	36x4½	36x4½
Carroll, 4D.......	Road.......	3000	2	40.00	128	36x4½	36x4½
Carroll, 4D.......	Road.......	3000	3	40.00	128	36x4½	36x4½
Carroll, 4D.......	Tour.......	3250	4	40.00	128	36x4½	36x4½
Carroll, 4D.......	Tour.......	3250	5	40.00	128	36x4½	36x4½
Carroll, 4D.......	Tour.......	3300	6	40.00	128	36x4½	36x4½
Carroll, 4D.......	Tour.......	3300	7	40.00	128	36x4½	36x4½
Carroll, 6C.......	Road.......	3250	2	40.90	128	36x4½	36x4½
Carroll, 6C.......	Road.......	3250	3	40.90	128	36x4½	36x4½
Carroll, 6C.......	Tour.......	3500	4	40.90	128	36x4½	36x4½
Carroll, 6C.......	Tour.......	3500	5	40.90	128	36x4½	36x4½
Carroll, 6C.......	Tour.......	3500	6	40.90	128	36–4½	36x4½
Carroll, 6C.......	Tour.......	3500	7	40.90	128	36x4½	36x4½
Chadwick, 19....	Tour.......	5500	7	60.00	133	36x4½	37x5
Chadwick, 19....	Tour.......	5500	5	60.00	133	36x4½	37x5
Chadwick, 19....	Limousine..	6500	7	60.00	133	36x4½	37x5
Chadwick, 19....	Road.......	5500	2	60.00	112	36x4½	36x4½
Chadwick, 19....	Road.......	5500	3	60.00	112	36x4½	36x4½
Chalmers, 17.....	Limousine..	3250	7	28.90	118	37x4½	37x4½
Chalmers, 18.....	Limousine..	3700	7	43.80	130	37x5	37x5
Cole, 50.........	Limousine..	3250	4	32.40	122	36x4	36x4
Cole, 60.........	Coupe......	3000	4	40.90	132	37x4½	37x4½
Cole, 60.........	Limousine..	3750	7	40.90	132	37x4½	37x4½
Columbia, 88.....	Road.......	$4500	2	38.00	129	36x4½	36x4½
Columbia, 88.....	Tour.......	4500	4	38.00	129	36x4½	36x4½
Columbia, 88.....	Tour.......	4500	7	38.00	129	36x4½	36x4½
Columbia, 88.....	Limousine..	5800	7	38.00	129	36x4½	36x4½
Columbia, 88.....	Land.......	5800	7	38.00	129	36x4½	36x4½
Columbia, 88.....	Tour.......	4500	6	38.00	129	36x4½	36x4½
Columbia, 85-2...	Road.......	3300	2	38.00	120	36x4½	36x4½
Columbia, 85-2...	Road.......	3300	4	38.00	120	36x4½	36x4½
Columbia, 85-2...	Tour.......	3400	6	38.00	120	36x4½	36x4½
Columbia, 85-2...	Tour.......	3500	7	38.00	120	36x4½	36x4½
Columbia, 85-2...	Limousine..	4800	7	38.00	120	36x4½	36x4½
Croxton, B-6.....	Tour.......	3000	6	28.90	138	36x4½	36x4½
Cunningham, M..	Tour.......	3500	7	36.10	124	36x4½	36x4½
Cunningham, M..	Phaeton....	3500	5	36.10	124	36x4½	36x4½
Cunningham, M..	Limousine..	4500	7	36.10	124	36x4½	36x4½
Cunningham, M..	Land.......	4500	7	36.10	124	36x4½	36x4½
Cunningham, M..	Road.......	3250	3	36.10	124	36x4½	36x4½
Diamond, T......	Opt........	3500	....	40.00	126	36x4½	36x4½
Duquesne, 50....	Tour.......	3000	5	33.75	133	36x4½	36x4½
Duquesne, 50....	Road.......	3000	3	33.75	133	36x4½	36x4½
Duquesne, 50....	Tour.......	3000	4	33.75	133	36x4½	36x4½
Duquesne, 50....	Road.......	3000	2	33.75	133	36x4½	36x4½
Edwards, 25.....	Tour.......	3500	5	25.60	120	36x4½	36x4½
Edwards, 25.....	Tour.......	3500	4	25.60	120	36x4½	36x4½
Edwards, 25.....	Road.......	3500	2	25.60	120	36x4½	36x4½
Edwards, 25.....	Limousine..	4600	7	25.60	120	36x4½	36x4½
Edwards, 25.....	Land.......	4700	7	25.60	120	36x4½	36x4½
Fiat, 54..........	Phateon....	4000	5	31.10	123	36x4½	36x4½
Fiat, 54..........	Tour.......	4000	7	31.10	123	36x4½	36x4½
Fiat, 54..........	Run........	4000	4	31.10	123	36x4½	36x4½
Fiat, 54..........	Limousine..	5000	7	31.10	123	36x4½	36x4½
Fiat, 54..........	Land.......	5100	7	31.10	123	36x4½	36x4½
Fiat, 56..........	Phaeton....	5000	5	46.65	135	36x4½	37x5
Fiat, 56..........	Tour.......	5000	7	46.65	135	36x4½	37x5
Fiat, 56..........	Run........	5000	4	46.65	135	36x4½	37x5
Fiat, 56..........	Limousine..	6000	7	46.65	135	36x4½	37x5
Fiat, 56..........	Land.......	6100	7	46.65	135	36x4½	36x5
Fiat, 55..........	Phaeton....	4500	5	42.00	128	36x4½	37x5
Fiat, 55..........	Tour.......	4500	7	42.00	128	36x4½	37x5
Fiat, 55..........	Road.......	4500	4	42.00	128	36x4½	37x5
Fiat, 55..........	Limousine..	5500	7	42.00	128	36x4½	37x5
Fiat, 55..........	Land.......	5600	7	42.00	128	36x4½	37x5
Firestone-Col. 90E	Tour.......	....	5	40.90	130	36x4½	36x4½
Firestone-Col. 90E	Tour.......	....	7	40.90	130	36x4½	36x44
Firest.-Col., 86-E..	Road.......	....	5	27.25	116	34x4	34x4½
Firest.-Col., 86-E..	Tour.......	....	3	27.25	116	34x4	34x

Automobiles Costing Over $3000

Name and Model	Body	Price	Seats	S.A.E. H.P.	Wheel-base	TIRES	
						Front	Rear
Firest.-Col., 60-E	Tour		5	32.40	122	36x4	36x4
Firest.-Col., 60-E	Tour		7	32.40	122	36x4	36x4
Firest.-Col., 60-E	Limousine		7	32.40	122	32x4	36x4
Franklin, D	Tour	$3600	5	38.40	123	36x4½	37x5
Franklin, H	Tour	3850	7	38.40	126	37x5	37x5
Franklin, H	Limousine	4850	7	38.40	126	37x5	37x5
Garford, G-14	Run	4500	2	43.80	139	37x5	37x5
Garford, G-14	Tour	4500	5 & 7	43.80	139	37x5	37x5
Garford, G-14	Limousine	5650	7	43.80	139	37x5	37x5
Garford, G-14	Land	5750	7	43.80	139	37x5	37x5
Great Eagle, B	Tour	3500	7	36.10	135	36x4½	36x4½
Great Eagle, B	Limousine	4000	7	36.10	135	36x4½	36x4½
Great Eagle, B	Limousine	4750	10	36.10	135	36x4½	36x4½
Great Eagle, B	Land	3500	7	36.10	135	36x4½	36x4½
Great Eagle, C	Tour	4000	7	40.90	142	37x5	37x5
Great Eagle, C	Limousine	4500	7	40.90	142	37x5	37x5
Great Eagle, C	Limousine	5250	10	40.90	142	37x5	37x5
Great Eagle, C	Land	4000	7	40.90	142	37x5	37x5
Haynes, 22	Limousine	3400	7	32.40	120	36x4½	36x4½
Haynes, 22	Berl	3500	7	32.40	120	36x4½	36x4½
Hudson, 37	Limousine	3250	7	27.25	118	36x4	36x4
Hudson, 54	Limousine	3750	7	40.90	127	36x4½	36x4½
Kissel, 60	Tour	3150	6	48.60	140	37x5	37x5
Kissel, 60	Tour	3150	7	48.60	140	37x5	37x5
Klinekar, 4-40	Limousine	3750	7	28.90	118	36x4	36x4
Klinekar, 6-50	Limousine	4350	7	40.70	126	36x4½	36x4½
Klinekar, 6-50	Coupe	3150	3	40.70	126	36x4½	36x4½
Klinekar, 6-60	Tour	3500	6	43.80	132	37x5	37x5
Klinekar, 6-60	Tour	3500	7	43.80	132	37x5	37x5
Klinekar, 6-60	Phaeton	3500	4	43.80	132	37x5	37x5
Klinekar, 6-60	Run	3250	2	43.80	132	37x5	37x5
Klinekar, 6-60	Coupe	3750	3	43.80	132	37x5	37x5
Klinekar, 6-60	Limousine	5000	7	43.80	132	37x5	37x5
Klinekar, 6-60	Meteor	3200	2	43.80	132	37x5	37x5
Knox, 44	Run	3350	2	40.00	122	36x4½	36x4½
Knox, 44	Tour	3400	4	40.00	122	36x4½	36x4½
Knox, 44	Run	3350	4	40.00	122	36x4½	36x4½
Knox, 44	Tour	3450	5	40.00	122	36x4½	36x4½
Knox, 44	Tour	3500	7	40.00	122	36x4½	36x4½
Knox, 45	Tour	3700	6	40.00	126	37x5	37x5
Knox, 45	Tour	3800	7	40.00	126	37x5	37x5
Knox, 45	Limousine	4700	7	40.00	126	37x5	37x5
Knox, 45	Land	4750	7	40.00	126	37x5	37x5
Knox, 46	Tour	4350	7	45.96	134	38x5	38x5
Knox, 46	Tour	4350	6	45.96	134	38x5	38x5
Knox, 46	Run	4350	2	45.96	134	38x5	38x5
Knox, 46	Limousine	5350	7	45.96	134	38x5	38x5
Knox, 46	Land	5400	7	45.96	134	38x5	38x5
Knox, 46	Run	4350	4	45.96	134	38x5	38x5
Knox, 66	Tour	5000	7	60.00	134	38x5½	38x5½
Knox, 66	Tour	5000	6	60.00	134	38x5½	38x5½
Knox, 66	Run	4800	2	60.00	134	38x5½	38x5½
Knox, 66	Run	4800	4	60.00	134	38x5½	38x5½
Knox, 66	Limousine	6400	7	60.00	134	38x5½	38x5½
Knox, 66	Land	6400	7	60.00	134	38x5½	38x5½
Locomobile, L	Tour	3600	5	32.40	120	34x4½	34x4½
Locomobile, L	Tour	3600	4	32.40	120	34x4½	34x4½
Locomobile, L	Roadster	3600	2	32.40	120	34x4½	34x4½
Locomobile, R	Tour	4300	5	43.80	128	36x4½	36x4½
Locomobile, R	Tour	4300	4	43.80	128	36x4½	36x4½
Locomobile, R	Road	4300	2	43.80	128	36x4½	36x4½
Locomobile, R	Limousine	5350	7	43.80	128	36x4½	36x4½
Locomobile, R	Berline	5500	7	43.80	128	36x4½	36x4½
Locomobile, R	Land	5650	7	43.80	128	36x4½	36x4½
Locomobile, M	Tour	5000	7	48.60	136	36x4½	37x5
Locomobile, M	Tour	5000	5	48.60	136	36x4½	37x5
Locomobile, M	Road	5000	2	48.60	136	36x4½	37x5
Locomobile, M	Limousine	6000	7	48.60	136	36x4½	37x5
Locomobile, M	Land	6100	7	48.60	136	36x4½	37x5
Lozier, 77	Tour	3250	5	31.60	127½	36x4½	36x4½
Lozier, 77	Coupe	3850	3	31.60	127½	36x4½	36x4½
Lozier, 77	Road	3250	3	31.60	127½	36x4½	36x4½
Lozier, 77	Limousine	4450	6	31.60	127½	36x4½	36x4½
Lozier, 77	Limousine	4450	5	31.60	127½	36x4½	36x4½
Lozier, 72	Tour	5000	7	51.60	131	36x4½	37x5
Lozier, 72	Limousine	6500	7	51.60	131	36x4½	37x5
Lozier, 72	Tour	5000	5	51.60	131	36x4½	37x5
Lozier, 72	Land	6500	7	51.60	131	36x4½	37x5
Lozier, 72	Road	5000	2	51.60	131	36x4½	37x5
Marmon, 32	Tour	3000	5	32.40	120	35x4½	35x4½
Marmon, 32	Tour	3125	7	32.40	120	35x4½	35x4½
Marmon, 32	Tour	3000	4	32.40	120	35x4½	35x4½
Marmon, 32	Limousine	4000	7	32.40	120	35x4½	35x4½
Marmon, 32	Land	4100	7	32.40	120	35x4½	35x4½
Marmon, 32	Coupe	3700	4	32.40	120	35x4½	35x4½
Marmon, Six	Tour	5000	7	48.60	145	36x4½	37x5
Marmon, Six	Tour	5000	5	48.60	145	36x4½	37x5
Marmon, Six	Tour	5000	4	48.60	145	36x4½	37x5
Marmon, Six	Road	5000	2	48.60	145	36x4½	37x5
Marmon, Six	Limousine	6250	7	48.60	145	36x4½	37x5
Marmon, Six	Ber	6450	7	48.60	145	36x4½	37x5
Marmon, Six	Land	6350	7	48.60	145	36x4½	37x5

Name and Model	Body	Price	Seats	S.A.E. H.P.	Wheel-base	TIRES	
						Front	Rear
Matheson, C	Tour	$4800	7	48.60	135	37x5	37x5
Matheson, C	Tour	4800	5	48.60	135	37x5	37x5
McFarlan, S	Coupe	3100	2	38.40	124	37x4½	37x4½
McFarlan, S	Coupe	3300	†	38.40	124	37x4½	37x4½
McFarlan, T	Coupe	3300	2	38.40	124	37x4½	37x4½
McFarlan, T	Coupe	3300	4	38.40	124	37x4½	37x4½
McFarlan, T	Limousine	3700	7	38.40	124	37x4½	37x4½
McFarlan, M	Limousine	4050	7	38.40	124	37x4½	37x4½
Midland, T-4	Sedan	3250	5	32.40	121	34x4	34x4
Morse, 34	Tour	4200	5	34.25	127	36x4½	36x4½
Morse, 34	Road	4200	2	34.25	127	36x4½	36x4½
Morse, 34	Limousine	5400	5	34.25	127	36x4½	36x4½
Morse, 34	Tour	4200	4	34.25	127	36x4½	36x4½
National, V	Tour	3300	5	38.00	128	36x4½	36x4½
National, V	Tour	3300	4	38.00	128	36x4½	36x4½
National, V	Tour	3400	7	38.00	128	36x5	36x5
National, V	Limousine	4800	7	38.00	128	36x5	36x5
National, V	Road	3150	2	38.00	120	34x4½	34x4½
Norwalk, A	Tour	3000	4	38.40	136	40x4½	40x4½
Norwalk, A	Tour	3100	6	38.40	136	40x4½	40x4½
Norwalk, B	Tour	3850	4	43.80	144	41x5	41x5
Norwalk, B	Tour	3750	6	43.80	144	41x5	41x5
Oldsmobile, 53	Road	3200	2	40.90	135	36x4½	36x4½
Oldsmobile, 53	Tour	3350	4	40.90	135	36x4½	36x4½
Oldsmobile, 53	Tour	4800	5	40.90	135	36x4½	36x4½
Oldsmobile, 53	Tour	5000	7	40.90	135	36x4½	36x4½
Oldsmobile, 53	Limousine	6500	7	40.90	135	36x4½	36x4½
Packard, 38	Run	4050	3	38.40	115½	36x4½	37x5
Packard, 38	Coupe	4500	3	38.40	115½	36x4½	37x5
Packard, 38	Coupe	4900	5	38.40	115½	36x4½	37x5
Packard, 38	Tour	4150	5	38.40	134	36x4½	37x5
Packard, 38	Limousine	5200	7	38.40	134	36x4½	37x5
Packard, 38	Land	5300	7	38.40	134	36x4½	37x5
Packard, 38	Limousine	5400	7	38.40	134	36x4½	37x5
Packard, 38	Phaeton	4150	5	38.40	138	36x4½	37x5
Packard, 38	Phaeton	4150	4	38.40	138	36x4½	37x5
Packard, 38	Broug	5200	5	38.40	138	36x4½	37x5
Packard, 48	Run	4650	3	48.60	121½	36x4½	37x5
Packard, 48	Coupe	5100	3	48.60	121½	36x4½	37x5
Packard, 48	Tour	4850	7	48.60	139	36x4½	37x5
Packard, 48	Limousine	5850	7	48.60	139	36x4½	37x5
Packard, 48	Land	5950	7	48.60	139	36x4½	37x5
Packard, 48	Limousine	6050	7	48.60	139	36x4½	37x5
Packard, 48	Phaeton	4750	5	48.60	139	36x4½	37x5
Packard, 48	Broug	5800	5	48.60	139	36x4½	37x5
Palmer-Sing., 64	Tour	3200	7	57.00	138	36x4	36x5
Palmer-Sing., 64	Tour	3000	5	57.00	138	36x4	36x5
Palmer-Sing., 64	Road	3000	2	57.00	138	36x4	36x5
Peerless, 29	Limousine	4200	6	25.00	113	34x4½	34x4½
Peerless, 29	Land	4300	6	25.60	113	34x4½	34x4½
Peerless, 35	Tour	4300	5	38.40	125	36x4½	36x4½
Peerless, 35	Tour	4300	4	38.40	125	36x4½	36x4½
Peerless, 35	Road	4300	3	38.40	125	36x4½	36x4½
Peerless, 35	Limousine	5300	7	38.40	125	36x4½	36x4½
Peerless, 35	Land	5400	7	38.40	125	36x4½	36x4½
Peerless, 35	Limousine	5500	7	38.40	125	36x4½	36x4½
Peerless, 35	Coupe	5000	3	38.40	125	36x4½	36x4½
Peerless, 36	Tour	5000	7	48.60	137	36x4½	37x5
Peerless, 36	Tour	5000	6	48.60	137	36x4½	37x5
Peerless, 36	Limousine	6000	7	48.60	137	36x4½	37x5
Peerless, 36	Land	6100	7	48.60	137	36x4½	37x5
Peerless, 36	Limousine	6200	7	48.60	137	36x4½	37x5
Peerless, 37	Tour	6000	7	60.00	140	38x5½	38x5½
Peerless, 37	Tour	6000	6	60.00	140	38x5½	38x5½
Peerless, 37	Limousine	7000	7	60.00	140	38x5½	38x5½
Peerless, 37	Land	7100	7	60.00	140	38x5½	38x5½
Peerless, 37	Limousine	7200	7	60.00	140	38x5½	38x5½
Pierce, 38C	Run	4300	3	38.40	132	36x4½	36x4½
Pierce, 38C	Tour	4300	4	38.40	132	36x4½	36x4½
Pierce, 38C	Tour	4300	5	38.40	132	36x4½	36x4½
Pierce, 38C	Broug	5200	7	38.40	132	36x4½	36x4½
Pierce, 38C	Land	5200	7	38.40	132	36x4½	36x4½
Pierce, 48D	Tour	5000	7	48.60	134½	37x5	37x5
Pierce, 48D	Tour	6100	7	48.60	134½	37x5	37x5
Pierce, 48D	Limousine	6100	7	48.60	134½	37x5	37x5
Pierce, 48B	Run	4850	3	48.60	142	37x5	37x5
Pierce, 48B	Tour	4850	5	48.60	142	37x5	37x5
Pierce, 48B	Tour	5000	7	48.60	142	37x5	37x5
Pierce, 48B	Limousine	6100	7	48.60	142	37x5	37x5
Pierce, 48B	Land	6100	7	48.60	142	37x5	37x5
Pierce, 66A	Tour	5850	5	60.00	147½	37x5	38x5½
Pierce, 66A	Tour	6000	7	60.00	147½	37x5	38x5½
Pierce, 66A	Limousine	7100	7	60.00	147½	37x5	38x5½
Pierce, 66A	Land	7100	7	60.00	147½	37x5	38x5½
Pope-Hart., 31	Limousine	3250	5	30.25	118½	36x4½	36x4½
Pope-Hart., 33	Tour	3250	5	36.10	124	36x4½	36x4½
Pope-Hart., 33	Tour	3500	7	36.10	124	36x4½	36x4½
Pope-Hart., 33	Phaeton	3250	5	36.10	124	36x4½	36x4½
Pope-Hart., 33	Road	3250	2	36.10	124	36x4½	36x4½
Pope-Hart., 33	Limousine	4300	7	36.10	124	36x4½	36x4½
Pope-Hart., 33	Land	4300	7	36.10	124	36x4½	36x4½

Automobiles Costing Over $3000

Name and Model	Body	Price	Seats	S.A.E. H.P.	Wheelbase	TIRES	
						Front	Rear
Pope-Hart., 33	Berl	$4550	7	36.10	124	36x4½	36x4½
Pope-Hart., 29	Tour	4250	7	46.10	133	37x5	37x5
Pope-Hart., 29	Phaeton	4250	5	46.10	133	37x5	37x5
Pope-Hart., 29	Road	4250	2	46.10	133	37x5	37x5
Pope-Hart., 29	Limousine	5300	7	46.10	133	37x5	37x5
Pope-Hart., 29	Land	5300	7	46.10	133	37x5	37x5
Pope-Hart., 29	Berl	5550	7	46.10	133	37x5	37x5
Premier 6-40	Limousine	4250	7	38.40	132	36x4½	36x4½
Premier 6-40	Coupe	3750	3	38.40	132	36x4½	36x4½
Premier, 6-60	Limousine	6000	7	48.60	137	37x5	37x5
Premier, 6-60	Limousine	5500	7	48.60	137	37x5	37x5
Premier, 6-60	Tour	4000	7	48.60	137	37x5	37x5
Premier 6-60	Tour	4000	5	48.60	137	37x5	37x5
Premier, 6-60	Coupe	5000	3	48.60	137	37x5	37x5
Premier, 6-60	Road	4000	2	48.60	137	37x5	37x5
Reeves, Sexto	Tour	4500	7	36.10	158	34x4½	34x4½
Republic, E	Tour	3150	7	43.80	132	36x4½	36x4½
Schlosser	Optional	......	......	40.00	124	36x4½	36x4½
Selden, 48	Limousine	3750	7	36.10	125	37x4½	37x4½
S.G.V., A	Land	3500	7	22.50	116	34x4	34x4
S.G.V., A	Land	3500	5	22.50	116	34x4	34x4
S.G.V., A	Limousine	3500	5	22.50	116	34x4	34x4
S.G.V., A	Limousine	3500	7	22.50	116	34x4	34x4
S.G.V., D	Run	3000	2	25.60	118	35x4½	35x4½
S.G.V., D	Tour	3250	5	25.60	118	35x4½	35x4½
S.G.V., D	Tour	3250	4	25.60	118	35x4½	35x4½
S.G.V., D	Land	4000	5	25.60	118	35x4½	35x4½
S.G.V., D	Land	4000	7	25.60	118	35x4½	35x4½
S.G.V., D	Limousine	4000	5	25.60	118	35x4½	35x4½
S.G.V., D	Limousine	4000	7	25.60	118	35x4½	35x4½
Simplex, 127	Tour	5600	5	38.00	127	35x5	35x5
Simplex, 127	Tour	5500	4	38.00	127	35x5	35x5
Simplex, 137	Tour	5700	7	38.00	137	35x5	35x5
Simplex, 137	Limousine	6400	5	38.00	137	35x5	35x5
Simplex, 137	Limousine	6400	4	38.00	137	35x5	35x5
Simplex, 137	Land	6400	4	38.00	137	35x5	35x5
Simplex, 137	Land	6400	5	38.00	137	35x5	35x5
Simplex, 137	Limousine	6500	7	38.00	137	35x5	35x5
Simplex, 137	Land	6500	7	38.00	137	35x5	35x5
Simplex, 137	Broug	6500	4	38.00	137	35x5	35x5
Simplex, 129	Tour	6100	5	53.00	129	36x4	36x5
Simplex, 129	Tour	6000	4	53.00	129	36x4	36x5
Simplex, 139	Tour	6200	7	53.00	139	36x5	36x5
Spoerer, 40G	Tour	3000	5	38.00	120	37x4½	37x4½
Spoerer, 40G	Tour	3200	7	38.00	120	37x4½	37x4½
Spoerer, 40G	Run	3000	2	38.00	120	37x4½	37x4½
Stearns, Kn., 4	Road	$3750	3	28.90	116	36x4½	36x4½
Stearns, Kn., 4	Tour	3750	4	28.90	121	36x4½	36x4½
Stearns, Kn., 4	Tour	3750	5	28.90	121	36x4½	36x4½
Stearns, Kn., 4	Limousine	5000	5	28.90	121	36x4½	36x4½
Stearns, Kn., 4	Land	5100	5	28.90	121	36x4½	36x4½
Stearns, Kn., 4	Tour	3900	7	28.90	127	36x4½	36x4½
Stearns, Kn., 4	Limousine	5000	5	28.90	127	36x4½	36x4½
Stearns, Kn., 4	Land	5100	5	28.90	127	36x4½	36x4½
Stearns, Kn., 6	Road	4850	3	43.80	134	37x5	37x5
Stearns, Kn., 6	Tour	4850	4	43.80	134	37x5	37x5
Stearns, Kn., 6	Tour	4850	5	43.80	134	37x5	37x5
Stearns, Kn., 6	Limousine	6100	5	43.80	134	37x5	37x5
Stearns, Kn., 6	Land	6200	5	43.80	134	37x5	37x5
Stearns, Kn., 6	Tour	5000	7	43.80	140	37x5	37x5
Stearns, Kn., 6	Limousine	6100	5	43.80	140	37x5	37x5
Stearns, Kn., 6	Land	6200	5	43.80	140	37x5	37x5
Stevens-Dur., C	Tour	4500	5	46.10	131	37x4½	37x4½
Stevens-Dur., C	Road	4500	2	46.10	131	37x4½	37x4½
Stevens-Dur., C	Phaeton	5000	5	46.10	131	37x4½	37x4½
Stevens-Dur., C	Berl	5550	5	46.10	131	37x4½	37x5
Stevens-Dur., C	Coupe	5000	2	46.10	131	37x4½	37x5
Stevens-Dur., C	Limousine	5500	7	46.10	131	37x4½	37x5
Stevens-Dur., C	Berl	5700	7	46.10	131	37x4½	37x5
Stevens-Dur., C	Tour	4750	7	46.10	138	37x4½	37x5
Stevens-Dur., C	Phaeton	5250	7	46.10	138	37x4½	37x5
Stevens-Dur., C	Limousine	5750	7	46.10	138	37x4½	37x5
Stevens-Dur., C	Berl	5950	7	46.10	138	37x4½	37x5
Stoddard-Day., 48	Limousine	3900	7	36.10	122½	36x4½	36x4½
Stoddard-Day., 13	Tour	5000	7	48.60	133	36x5	36x5
Stoddard-Day., 13	Limousine	6250	7	48.60	133	36x5	36x5
Stoddard-Day., 13	Road	4900	2	48.60	133	36x5	36x5
Winton, 17D	Tour	3000	5	48.60	130	36x4½	36x4½
Winton, 17D	Tour	3000	4	48.60	130	36x4½	36x4½
Winton, 17D	Tour	3250	6	48.60	130	36x4½	36x4½
Winton, 17D	Tour	3250	7	48.60	130	36x4½	36x4½
Winton, 17D	Limousine	4250	7	48.60	130	36x4½	36x4½
Winton, 17D	Limousine	4500	7	48.60	130	36x4½	36x4½
Winton, 17D	Land	4500	7	48.60	130	36x4½	36x4½
Velie, 40	Limousine	3000	5	32.40	118	36x4	36x4
White, GRE	Coupe	3250	3	22.50	110	34x4	34x4
White, GEB	Tour	3300	5	28.90	120	36x4½	36x4½
White, GEB	Tour	3500	7	28.90	120	36x4½	36x4½
White, GEB	Road	3300	2	28.90	120	36x4½	36x4½
White, GEB	Coupe	4100	3	28.90	120	36x4½	36x4½
White, GEB	Limousine	5000	7	28.90	120	36x4½	36x4½
White, GF	Tour	5000	7	43.80	132	37x5	37x5
White, GF	Tour	5000	5	43.80	132	37x5	37x5
White, GF	Road	4800	2	43.80	132	37x5	37x5
White, GF	Limousine	6300	7	43.80	132	37x5	37x5

(*Continued from page* 100.)

Motors for the year 1913 include ninety-one power plants, eighty-six of which are of the long-stroke type; in other words, the makers of 95 per cent. of the high-priced automobiles have become convinced of the often-elaborated advantages of long-stroke designs. Only one car in this class has a short-stroke motor, and four square motors are in use. Among the long-stroke designs, the Lozier 77 motor ranks foremost, with a stroke-bore ratio of 1.51, being followed by the Bergdoll 40, 1.48:1, and Peerless 37 and Pierce 6-66, both with a ratio of 1.4:1. The smallest ratio is that of the Adams-Farwell cylinders, namely .91:1. The practical progress made by the Knight motor, so far as the number of manufacturers is concerned, is rather modest; in addition to Stearns, Atlas, Columbia and Stoddard-Dayton, one company, the Edwards, has taken up the manufacture of the sleeve-valve motor, so that now nine models of cars equipped with the silent Knight power plant are on the market. The six-cylinder power plant constructions have gained in numbers and now compose forty-seven of the motors on hand, or 52.5 per cent., while there are forty-three four-cylinder designs and one five-cylinder, rotary motor.

Another respect in which automobile luxury has been augmented is the wide use of electric lighting-generator outfits in this class of cars. This type of outfit has made most remarkable strides since last year and is today almost universal in the $4,000 class of automobiles. Together with several battery lighting outfits it has entirely supplanted the acetylene tank and headlights in this department of the show. A most scrutinizing inspection has revealed the fact that of the fifty-eight makes included in this class, fifty-three, or 91 per cent., are fitted with electric lighting generators of perhaps a dozen makes. Five makes of automobiles are equipped with storage batteries to be charged at the garage for lighting purposes.

The Pierce-Arrow 66-A is the leader in wheelbase length, with 147.5 inches, being followed by the Marmon Six with 145 inches and the Norwalk with 144 inches. There are a number of 140-inch cars and a host of such having wheelbase lengths from 130 to 130 inches. The shortest wheelbase is that of the Alco 7-16 landaulet, namely, 104 inches. As heretofore, the standard tread has been preserved at 56 inches in the majority of cases, with exceptions or options at 60 inches.

As regards tire sizes, the American, formerly the leader in large wheels, has been superseded by the Norwalk, a new-comer, with 41 by 5-inch tires. The most common tire size in this department is still 36 by 3.5 inches, but a number of 37 and 38-inch tires have been introduced this year.

One of the questions which have been in the foreground during 1912 is that of the position of the steering wheel. A vigorous campaign in favor of the left-hand steer has been conducted during the past twelvemonth, and as a result, fourteen companies out of fifty-eight, or 24 per cent., have introduced the left-hand control on their automobiles.

A comparison between the cars listed in the $4,000 class and those enumerated in it a year ago shows many changes. There are thirteen companies listed in this department for the first time, some of whom appear for the first time.

Automobiles Costing $1250 and Under

Name and Model	Body	Price	Seats	S.A.E. H.P.	Wheelbase	TIRES Front	TIRES Rear
Auburn 33L	Road	$1150	2	22.50	112	34x3½	34x3½
Auburn, 33L	Tour	1150	5	22.50	112	34x3½	34x3½
Buick, 24	Road	950	2	22.50	105	32x3½	32x3½
Buick, 25	Tour	1050	5	22.50	105	32x3½	32x3½
Buick, 30	Road	1125	2	25.60	108	34x4	34x4
Cameron, 28	Tour	800	4	24.00	104	32x3	32x3
Cameron, 29A	Tour	950	5	24.00	110	32x3½	32x3½
Cameron, 30	Flyer	1200	2	36.07	114	34x3½	34x3½
Crow-Elkhart, C-1	Road	.....	2	22.50	112	32x3½	32x3½
Crow-Elkhart, C-2	Tour	.....	5	25.60	114	34x3½	34x3½
Detroiter, A-3	Road	900	2	18.25	104	32x3½	32x3½
Detroiter, A-4	Road	900	2	18.25	104	32x3½	32x3½
Detroiter, A	Tour	850	5	18.25	104	32x3½	32x3½
Detroiter, A-1	Tour	900	5	18.25	104	32x3½	32x3½
Detroiter, A-2	Tour	900	5	18.25	104	32x3½	32x3½
Duryea, F.P.	Run	625	2	.....	80	30x3	36x3
Duryea, F.P.	Buggy	487	2	.....	80	1¼	1⅜
Duryea, F.P.	Surrey	537	4	.....	90	1⅜	1½
Duryea, F.P.	Vict	625	2	.....	100	1⅜	1½
Empire, 25	Tour	950	5	19.60	104	32x3½	32x3½
Ford, T	Tour	600	5	22.50	100	30x3	30x3½
Ford, T	Run	525	2	22.50	100	30x3	30x3½
Ford, T	Town Car	800	6	22.50	100	30x3	30x3½
Gleason, R	Run	850	2	18.00	96	36x2	36x2
Gleason, R	Run	875	3	18.00	96	36x2	36x2
Gleason, R	Tour	1000	5	18.00	96	36x2	36x2
Halladay, 32	Road	1200	2	22.50	112	33x4	33x4
Halladay, 32	Tour	1200	5	22.50	112	33x4	33x4
Hupmobile, C	Run	750	2	16.90	86	30x3	30x3
Hupmobile, E	Road	850	2	16.90	110	30x3	30x3
Hupmobile, H	Road	975	2	16.90	106	32x3½	32x3½
Hupmobile, H	Tour	975	4	16.90	106	32x3½	32x3½
Hupmobile, C	Coupe	1100	3	16.90	86	30x3	30x3
Hupmobile, E	Coupe	1150	3	16.90	110	30x3	31x3½
King	Road	1190	2	22.50	110	32x3½	32x3½
Krit, K	Road	900	2	22.50	106	32x3½	32x3½
Krit, K	Tour	900	5	22.50	106	32x3½	32x3½
Lambert, 40	Tour	1130	5	16.90	112	32x3½	32x3½
Little Four	Run	690	2	19.60	90	30x3½	30x3½
Lion, 30	Road	890	2	19.60	110	32x3½	32x3½
Marathon, Run'r.	Road	875	2	19.60	104	32x3½	32x3½
Marathon, Run'r.	Tour	950	5	19.60	104	32x3½	32x3½
Marathon, Run'r.	Coupe	1050	2	19.60	104	32x3½	32x3½
Mason, A	Tour	.....	4	20.00	96	32x3½	32x3½
Mason, C	Tour	.....	5	20.00	96	32x3½	32x3½
Maxwell, 4	Road	785	2	22.50	93	30x3½	30x3½
Maxwell, 8	Road	1110	2	25.60	106	32x3½	32x3½
Maxwell, 8	Tour	1145	5	25.60	106	32x3½	32x3½
Metz	Run	495	2	22.50	90	30x3	30x3
Motorette, M1	Run	350	2	11.25	74	28x2½	28x3
Motorette, R1	Run	350	3	11.25	74	28x2½	28x3
Oakland, 35	Road	1000	3	19.60	112	32x3½	32x3½
Oakland, 35	Tour	1075	5	19.60	112	32x3½	32x3½
Only, A	Run	1000	2	28.90	112	32x3½	32x3½
Overland, 69	Road	985	2	25.60	110	32x3½	32x3½
Overland, 69	Tour	985	5	25.60	110	32x3½	32x3½
Overland, 69	Tour	1010	4	25.60	110	32x3½	32x3½
Paige, 25	Road	950	2	22.50	110	32x3½	32x3½
Paige, 25	Tour	950	5	22.50	110	32x3½	32x3½
Perfex, 2	Road	1050	2	22.50	106	32x3½	32x3½
R.C.H	Road	900	2	16.90	110	32x3½	32x3½
R.C.H	Tour	900	5	16.90	110	32x3½	32x3½
Regal, N	Road	900	2	22.50	108	32x3½	32x3½
Regal, T	Tour	950	4	22.50	108	32x3½	32x3½
Reo, The Fifth	Road	1095	2	25.60	112	34x4	34x4
Reo, The Fifth	Tour	1095	5	25.60	112	34x4	34x4
Richmond, O	Road	1100	2	25.60	112	34x3½	34x3½
Richmond, O	Tour	1200	5	25.60	112	34x3½	34x3½
Studebaker, 20	Road	750	2	20.30	102	30x3	30x3½
Studebaker, 20	Suburban	800	4	20.50	102	30x3	30x3
Studebaker, 20	Coupe	1050	2	20.50	102	30x3	30x3
Studebaker, 20	Tour	800	4	20.50	102	32x3	32x3
Studebaker, 25	Road	875	2	19.60	101	30x3½	30x3½
Studebaker, 25	Tour	885	5	19.60	101	30x3½	30x3½
Studebaker, 30	Road	1100	2	25.60	112	32x3½	32x3½
Studebaker, 30	Demi-Ton	1100	4	25.60	112	32x3½	32x3½
Studebaker, 30	Tour	1100	5	25.60	112	32x3½	32x3½

CHEAP CARS, that is, cars selling at $1,250 and less, are the products of thirty-one makers. Seven of these are new in their class, they being the Detroiter, Mason, Perfex, Gleason, King, Lambert and McIntyre. The companies who have ceased to manufacture low-priced cars are twenty-seven, and among them are the makers of Brush, DeTamble, Jonz, Cutting, Jackson, Mitchell, Schacht, Cartercar, Herreshoff and Elmore.

The average power plant is a four-cylinder, water-cooled motor, with a stroke-bore ratio of 1.21:1, while last year's ratio was 1.15:1. The practice of casting enbloc prevails as it did last year, and if anything has gained followers. The average horsepower is 21.51 as against 21.18 last year, but the actual rating of the motors varies from 11.25 (Motorette) to 28.90 (Only). The thirty-six power plants used by the thirty-one makers in this class include thirty-two four-cylinder motors, three two-cylinder and one six-cylinder power plant, the Cameron 30. Out of all these motors only four have bores and strokes of equal length and two the stroke shorter than the bore. Poppet-valve motors are used without exception.

The wheelbase has been slightly lengthened for 1913, giving an average of 104.2, while last year this dimension was 104 inches. The Motorette has the minimum wheelbase, 74 inches, while the maximum of 114 inches is that of the Cameron Flyer. Tires vary in size from 28 by 2.5 inches for the front and 28 by 3 inches for the rear (Motorette) to 34 by 4-inch all-around equipment as used by Buick and Reo cars.

Nine companies out of thirty-one, or 29 per cent., use the left-hand control at least on part of their models. This speaks volumes for the alertness of the manufacturers of small cars who are quick to see advantages of construction and to utilize them in order to increase the comfort of their customers. The public has shown great favor toward the left-hand control, and considering that Ford, R-C-H, Reo the Fifth and Maxwell are equipped with this type of control, it may safely be said that a very considerable portion of the total 1913 output of automobile factories will be equipped with the left-hand steer.

More conservatism, however, is displayed in respect of the lighting equipment, which has also been a pertinent problem during the past two years. In the small-car class acetylene lighting has remained prevalent, and only Auburn, Oakland and Halladay use electric lighting generators, while nine companies include storage batteries in their equipment. In other words, 61 per cent. of small-car makers use acetylene headlights.

There are seventy-seven different models in the $1,000-car class, which belong to twelve types, according to the bodies used on them. The majority of these are roadsters and five-passenger touring cars, numbering twenty-six and twenty-four respectively, or 33.8 and 31.2 per cent., respectively. Furthermore, ten runabouts, and six four-passenger touring cars, as well as four coupés, are offered in this class, while there is one car equipped with each of the following body types: towncar, demi-tonneau, suburban, victoria, surrey, buggy, flyer. Thus, out of seventy-seven models only five are fitted with closed bodies, so that 93.5 per cent. of the low-priced cars are open to the air; this condition is characteristic of low-priced cars today, as is brought out strikingly by a comparison with the figures given in concondition is characteristic of low-priced cars today.

Automobiles Costing from $1251 to $1999

Name and Model	Body	Price	Seats	S.A.E. H.P.	Wheel-base	TIRES Front	TIRES Rear
Abbott-Detroit, E.	Demi-Ton...	$1975	4	32.40	121	36x4½	36x4½
Abbott-Detroit, D.	Road.......	1700	2	27.30	116	34x4	34x4
Alpena, P-40.....	Road.......	1750	2	22.50	135	36x4	36x4
Alpena, P-40.....	Tour.......	1800	4	22.50	135	36x4	36x4
Alpena, P-40.....	Tour.......	1800	5	22.50	135	36x4	36x4
Alpena, P-40.....	Tour.......	1890	6	22.50	135	36x4	36x4
Alpena, P-40.....	Tour.......	1890	7	22.50	135	36x4	36x4
Amer., Scout, 22A	Road.......	1475	2	22.50	105	36x3½	36x3½
Ames, 44.........	Road.......	1595	2	27.30	118	36x4	36x4
Ames, 45.........	Tour.......	1635	5	27.30	118	36x4	36x4
Apperson, 4-45...	Road.......	1600	2	32.40	114	34x4	34x4
Apperson, 4-45...	Tour.......	1600	5	32.40	114	34x4	34x4
Arbenz, F........	Tour.......	1875	5	27.30	120	36x4	36x4
Arbenz, G........	Torpedo....	1875	4	27.30	120	36x4	36x4
Arbenz, H........	Road.......	1825	2	27.30	120	36x4	36x4
Auburn, 37L......	Tour.......	1400	5	28.90	115	35x4	35x4
Auburn, 40L......	Road.......	1650	2	32.40	122	36x4	36x4
Auburn, 40L......	Tour.......	1650	5	32.40	122	36x4	36x4
Bergdoll, C-30....	Road.......	1600	2	25.60	115	34x4	34x4
Bergdoll, C-30....	Tour.......	1600	5	25.60	115	34x4	34x4
Bergdoll, C-30....	Fore Door...	1600	4	25.60	115	34x4	34x4
Bergdoll, C-30....	Torpedo....	1600	4	25.60	115	34x4	34x4
Bergdoll, D-40....	Road.......	1800	2	25.60	115	34x4	34x4
Bergdoll, D-40....	Torpedo....	1800	4	25.60	115	34x4	34x4
Bergdoll, D-40....	Tour.......	1800	5	25.60	115	34x4	34x4
Buick, 31........	Fore Door...	1285	5	25.60	108	34x4	34x4
Buick, 40........	Tour.......	1650	5	28.90	115	36x4	36x4
Burg, S..........	Run........	1975	3	33.75	134	36x4	36x4
Burg, R..........	Tour.......	1975	5	40.90	134	36x4	36x4
Cadillac, 1913....	Road.......	1975	2	32.40	120	36x4½	36x4½
Cadillac, 1913....	Torpedo....	1975	4	32.40	120	36x4½	36x4½
Cadillac, 1913....	Phaeton....	1975	4	32.40	120	36x4½	36x4½
Cadillac, 1913....	Tour.......	1975	5	32.40	120	36x4½	36x4½
Cameron, 32......	Tour.......	1450	5	36.07	120	34x3½	34x3½
Carhartt, K.......	Run........	1450	3	26.40	109	34x4	34x4
Carhartt, K.......	Tour.......	1450	5	26.40	109	34x4	34x4
Carhartt, B.......	Run........	1850	3	32.40	119	34x4	34x4
Carhartt, B.......	Tour.......	1850	5	32.40	119	34x4	34x4
Cartercar, 5......	Road.......	1600	2	27.25	116	36x4	36x4
Cartercar, 5......	Tour.......	1700	5	27.25	116	36x4	36x4
Cartercar, 5......	Coupe......	$1900	3	27.25	116	36x4	36x4
Case, N..........	Road.......	1350	2	27.25	115	34x4	34x4
Case, N..........	Tour.......	1500	5	27.25	115	34x4	34x4
Case, O..........	Road.......	1985	2	32.40	125	37x4½	37x4½
Colby, C.........	Road.......	1850	2	27.25	118	34x4½	34x4½
Colby, C.........	Tour.......	1850	5	27.25	118	34x4½	34x4½
Cutting, A-40.....	Road.......	1475	2	25.60	120	36x4	36x4
Cutting, B-40.....	Tour.......	1475	5	25.60	120	36x4	36x4
Crawford, 13-30..	Road.......	1750	2	27.25	115	34x4	34x4
Crawford, 13-30..	Tour.......	1750	5	27.25	115	34x4	34x4
Crow-Elkhart, C-3	Road.......	....	2	25.60	114	34x3½	34x3½
Crow-Elkhart, C-4	Tour.......	....	5	25.60	114	34x3½	34x3½
Crow-Elkhart, C-5	Tour.......	....	5	27.25	122	35x4	35x4
Correja, T & D...	Run........	1650	2	28.90	125	36x4	36x4
Correja, T & D...	Tour.......	1650	4	28.90	125	36x4	36x4
Correja, T & D...	Tour.......	1650	5	28.90	125	36x4	36x4
Correja, A........	Run........	1450	2	28.90	105	34x3½	34x3½
Correja, C........	Road.......	1450	2	28.90	105	34x3½	34x3½
Correja, B........	Coupe......	1850	2	28.90	105	34x3½	34x3½
Correja, S & R...	Run........	1950	2	28.90	120	36x4	36x4
Correja, G........	Run........	1850	2	19.60	125	34x4	34x4
Correja, J........	Tour.......	1850	5	19.60	125	34x4	34x4
Corbitt, D........	Run........	1800	2	25.60	120	34x4	34x4
Corbitt, E........	Tour.......	1875	4	25.60	120	34x4	34x4
Corbitt, F........	Tour.......	1875	5	25.60	120	34x4	34x4
Cino, 440-A......	Tour.......	1600	5	32.60	120	34x4	34x4
Cino, 440-R......	Road.......	1600	2	32.60	120	34x4	34x4
Cino, 450........	Tour.......	1850	5	32.60	120	34x4	34x4
Cole, 40..........	Run........	1685	2	27.25	116	36x4	36x4
Cole, 40..........	Tour.......	1685	5	27.25	116	36x4	36x4
Cole, 50..........	Run........	1985	2	32.40	122	36x4	36x4
Cole, 50..........	Tour.......	1985	5	32.40	122	36x4	36x4
Davis, 40C.......	Run........	1850	2	27.25	118	36x4	36x4
Davis, 40E.......	Tour.......	1850	4	27.25	118	36x4	36x4
Davis, 40D.......	Tour.......	1850	5	27.25	118	36x4	36x4
Davis, 50A.......	Tour.......	1950	2	32.40	118	36x4	36x4
Davis, 50B.......	Run........	1950	2	32.40	118	36x4	36x4
Day Utility, D....	Tour.......	1500	5	25.60	115	34x4	34x4
Enger, F.........	Tour.......	1475	5	32.40	120	34x4	34x4
Enger, J.........	Tour.......	1475	4	32.40	120	34x4	34x4

IN REVIEWING the $1,500 car several striking points come up. For one thing, this group contains almost exclusively cars having decidedly long-stroke motors, with an average bore slightly less than what it was last year. Consequently the average horsepower rating according to the S. A. E. formula is less than what it was a year ago; while as a matter of fact an actual power increase has been realized in the cases of most cars. The wheelbases have been lengthened, and many firms have introduced electric lighting, left-hand control, self-starters and other appliances which tend to increase comfort.

To be exact, the average motor in this class has the following characteristics: Bore, 4.13 inches, stroke, 5 inches, ratio, 1.21:1. The cylinders are cast in pairs and water-cooled. The average horsepower is 28.81, while in 1912 it was 30.01, when the stroke-bore ratio was 1.14:1. The actual maximum and minimum of horsepower on this class are 36.10 (Imperial 44) and 16.90 (R-C-H). As a matter of fact, there are 110 power plants used by the seventy-nine companies making cars which range in this class, and 106 out of these 110 have a stroke-bore ratio greater than 1.1, while the other four motors are square, so-called. Ninety-nine engines are of the four-cylinder type and eleven are six-cylinder designs.

The increased length of the chassis is evidenced by the average wheelbase being 118.4, or 2.4 inches in excess of what it was last year. The longest wheelbase in this class is that of the Burg, namely, 134 inches, while Franklin and Regal with 100 inches each are tied for minimum wheelbase. Tire sizes range from 32 by 3.5 inches to 36 by 4.5 inches.

Each of the seventy-nine makers manufactures, as an average, three models, a total of 213 different models, as follows:

Five-p. touring............	100	100	Fore-door body.................	3
Roadster	57	57	Six-p. touring..................	2
Runabout	22		Phaeton	2
Coupé	12		Speedster	2
Four-p. touring............	11		Semi-racer	2
Seven-p. touring...........	6		Two-p. touring..................	1
Torpedo	7		Demi-tonneau	1
Toy tonneau................	4		Semi-touring	1

The prevalence of five-passenger touring cars which compose 43 per cent. of the models offered at this time is remarkable and indicates that a very large portion of touring cars are recruited from this class of automobiles. In fact, the touring cars of the $1,500 class compose 28.5 per cent. of all the touring models announced for 1913. Only 5.4 per cent. of the cars in this class, namely, the coupés, are closed designs. Eighty-four models, or 36.2 per cent., of the 232 models, are two-passenger designs.

Nineteen out of the seventy-nine companies have equipped their products, or at least part of them, with left-hand control. This means 24 per cent., and together with two companies making the left steer optional, 26 per cent. of the $1,500-car manufacturers. A similarly progressive position has been taken by the makers of this class of cars in equipping 80 per cent. of their output with electric lights, 52 per cent. of the makers using generators and 28 per cent. batteries only.

While twenty-three manufacturers who were represented in this class last year have disappeared from the class list, twenty-five new ones have come up instead. Actually new among these are the manufacturers of the following cars: Henderson, Mason, Nyberg, Omaha and Pacific Special.

Automobiles Costing from $1251 to $1999

Name and Model	Body	Price	Seats	S.A.E. H.P.	Wheelbase	TIRES Front	TIRES Rear
Enger, E	Road	$1475	2	32.40	120	34x4	34x4
Enger, P	Tour	1750	5	32.40	120	36x4	36x4
Falcar, 35	Run	1850	2	27.25	116	34x4	34x4
Falcar, 35	Road	1850	3	27.25	116	34x4	34x4
Falcar, 35	Toy Ton	1850	4	27.25	116	34x4	34x4
Falcar, 35	Tour	1850	7	27.25	116	34x4	34x4
Flanders, 40	Tour	1550	5	31.60	118	34x4	34x4
Franklin, G	Run	1650	2	25.60	100	32x3½	32x3½
Glide, 36	Speed	1690	2	27.25	118	34x4	34x4
Glide, 36	Tour	1690	5	27.25	118	34x4	34x4
Great Southern, 30	Road	1400	2	25.60	113	34x4	34x4
Great Southern, 30	Tour	1400	5	25.60	113	34x4	34x4
Great West., 1913	Road	1585	2	28.90	118	36x4	36x4
Great West., 1913	Tour	1585	4	28.90	118	36x4	36x4
Great West., 1913	Tour	1585	5	28.90	118	36x4	36x4
Halladay, 40	Road	1800	2	32.40	118	36x4	36x4
Halladay, 40	Toy Ton	1800	4	32.40	118	36x4	36x4
Halladay, 40	Tour	1800	5	32.40	118	36x4	36x4
Havers, 44	Road	1850	2	33.75	122	36x4	36x4
Havers, 44	Tour	1850	4	33.75	122	36x4	36x4
Havers, 44	Tour	1850	5	33.75	122	36x4	36x4
Henderson, 44	Road	1385	2	27.25	116	34x4	34x4
Henderson, 46	Tour	1485	5	27.25	116	34x4	34x4
Herreshoff, 30	Run	1250	2	18.25	100	34x4	34x4
Herreshoff, 30	Tour	1350	5	18.25	110	34x4	34x4
Herreshoff, 36	Run	1700	2	27.25	124	34x4	34x4
Herreshoff, 36	Tour	1700	5	27.25	124	34x4	34x4
Hudson, 37	Road	1875	2	27.25	118	36x4	36x4
Hudson, 37	Torpedo	1875	5	27.25	118	36x4	36x4
Hudson, 37	Tour	1875	5	27.25	118	36x4	36x4
Imperial, 34	Tour	1650	5	32.40	118	34x4	34x4
Imperial, 44	Tour	1875	5	36.10	122	36x4	36x4
Jackson, Olympic	Tour	1500	5	27.25	115	34x4	34x4
Jackson, Majestic	Tour	1850	5	32.40	124	36x4	36x4
King, 1913	Tour	1500	5	25.60	115	34x4	34x4
Kissel, 30	Semi-Rac	1700	2	28.90	116	34x4	34x4
Kissel, 30	Semi-Tour	1700	5	28.90	116	34x4	34x4
Klinekar, 4-30	Run	1850	2	25.60	115	34x4	34x4
Klinekar, 4-30	Toy Ton	1850	4	25.60	115	34x4	34x4
Klinekar, 4-30	Tour	1850	5	25.60	115	34x4	34x4
Lambert, 99	Tour	1250	5	28.90	117	34x3½	34x3½
Marathon, Win'r	Road	1275	2	28.90	116	34x4	34x4
Marathon, Win'r	Tour	1350	5	28.90	116	34x4	34x4
Marathon, Win'r	Coupe	1600	2	28.90	116	34x4	34x4
Marathon, Cham	Road	1675	2	32.40	123	36x4	36x4
Marathon, Cham	Tour	1750	5	32.40	123	36x4	36x4
Marathon, Cham	Tour	1800	7	32.40	123	36x4	36x4
Marion, 37A	Tour	1475	5	25.60	112	34x4	34x4
Marion, 36A	Road	1425	2	25.60	112	34x4	34x4
Marion, 48A	Tour	1850	5	27.25	120	36x4	36x4
Mason, K	Run	1290	2	25.60	116	36x3½	36x3½
Mason, K	Tour	1290	5	25.60	116	36x3½	36x3½
Maxwell, 10	Road	1675	2	28.90	115	36x4	36x4
Maxwell, 10	Tour	1675	5	28.90	115	36x4	36x4
McIntyre, G-13	Run	1485	2	29.40	116	34x4	34x4
McIntyre, G-13	Tour	1485	5	29.40	116	34x4	34x4
Michigan, R	Tour	1585	5	28.90	118	35x4½	35x4½
Michigan, S	Road	1585	2	28.90	118	35x4½	35x4½
Michigan, L	Tour	1400	5	26.40	114	34x4	34x4
Michigan, O	Road	1400	2	26.40	114	34x4	34x4
Midland, T-4	Road	1685	2	32.40	121	34x4	34x4
Midland, T-4	Speed	1685	5	32.40	121	34x4	34x4
Midland, T-4	Tour	1685	5	32.40	121	34x4	34x4
Miller, 40	Tour	1450	5	27.25	116	34x4	34x4
Mitchell, 5-4	Run	1500	2	28.90	120	36x4	36x4
Mitchell, 5-4	Tour	1500	5	28.90	120	36x4	36x4
Mitchell, 5-6	Run	1850	2	33.75	132	36x4	36x4
Mitchell, 5-6	Tour	1850	5	33.75	132	36x4	36x4
Moline, M-40	Road	1950	2	27.25	124	36x4	36x4
Moline, M-40	Tour	1950	5	27.25	124	36x4	36x4
Moon, 39	Road	1650	2	25.60	116	34x4	34x4
Moon, 39	Torpedo	1650	4	25.60	116	34x4	34x4
Moon, 39	Tour	1650	5	25.60	116	34x4	34x4
Moon, 48	Road	1985	2	32.40	121	36x4	36x4
Moon, 48	Torpedo	1985	4	32.40	121	36x4	36x4
Moon, 48	Tour	1985	5	32.40	121	36x4	36x4

Name and Model	Body	Price	Seats	S.A.E. H.P.	Wheelbase	TIRES Front	TIRES Rear
Nyberg, 4-37	Road	$1285	2	22.50	118	34x4	34x4
Nyberg, 4-37	Tour	1295	5	22.50	118	34x4	34x4
Nyberg, 4-40	Road	1400	2	28.90	128	36x4	36x4
Nyberg, 4-40	Tour	1450	5	28.90	128	36x4	36x4
Nyberg, 6-45	Road	1950	2	33.75	126	36x4	36x4
Oakland, 42	Road	1600	3	27.25	116	34x4	34x4
Oakland, 42	Toy Ton	1600	4	27.25	116	34x4	34x4
Oakland, 42	Tour	1600	5	27.25	116	34x4	34x4
Omaha, 42	Road	1385	2	26.40	116	36x4	36x4
Omaha, 42	Tour	1385	5	26.40	116	36x4	36x4
Only, A	Tour	1250	5	28.90	112	32x3½	32x3½
Overland, 69	Coupe	1500	3	25.60	110	32x3½	32x3½
Overland, 71	Road	1475	2	30.63	114	34x4	34x4
Overland, 71	Tour	1475	4	30.63	114	34x4	34x4
Overland, 71	Tour	1475	5	30.63	114	34x4	34x4
Pacific Spec., A	Tour	1950	5	32.40	121	34x4	34x4
Pacific Spec., B	Road	1950	2	32.40	121	34x4	34x4
Paige, 25	Coupe	1500	3	22.50	110	33x4	33x4
Paige, 25	Coupe	1600	5	22.50	110	33x4	33x4
Paige, 36	Tour	1275	5	25.60	116	34x4	34x4
Paige, 36	Road	1275	2	25.60	116	34x4	34x4
Paige, 36	Coupe	....	3	25.60	116	34x4	34x4
Paige, 36	Coupe	....	5	25.60	116	34x4	34x4
Paterson, 43	Tour	1685	5	27.25	116	34x4	34x4
Paterson, 47	Tour	1985	7	32.40	122	36x4	36x4
Pathfinder, 13	Tour	1875	5	27.25	120	36x4	36x4
Pathfinder, 13	Phaeton	1875	4	27.25	120	36x4	36x4
Pathfinder, 13	Road	1875	2	27.25	120	36x4	36x4
Pilot, 50	Tour	2250	5	32.40	126	36x4	36x4
Pratt, 30	Road	1400	2	25.60	114	32x3½	32x3½
Pratt, 30	Tour	1400	5	25.60	114	32x3½	32x3½
Pratt, 40	Road	1850	2	32.40	120	36x4	36x4
Pratt, 40	Tour	1850	5	32.40	120	36x4	36x4
Pratt, 40	Tour	1950	7	32.40	120	36x4	36x4
Pullman, 4-36	Tour	1675	5	26.40	118	34x4	34x4
Pullman, 4-36	Tour	1850	5	26.40	118	34x4	34x4
Rambler, Cross-C	Tour	1700	5	32.40	120	36x4	36x4
Rambler, Cross-C	Tour	1700	4	32.40	120	36x4	36x4
Rambler, Cross-C	Road	1650	2	32.40	120	36x4	36x4
Rambler, Cross-C	Tour	1900	7	32.40	120	37x4½	37x4½
R.C.H	Coupe	1300	2	16.90	110	32x3½	32x3½
Regal	Coupe	1250	3	22.50	100	32x3½	32x3½
Regal, H	Tour	1400	5	28.90	118	34x4	34x4
Regal, C	Tour	1250	5	25.60	116	34x4	34x4
Reo, The Fifth	Limousine	1600	7	25.60	112	34x4	34x4
Richmond, P	Tour	1750	5	32.40	120	36x4	36x4
Schacht, NS	Tour	1775	5	28.90	120	36x4	36x4
Schacht, KL	Road	1775	2	28.90	120	36x4	36x4
Spaulding, G	Tour	1650	5	28.90	120	36x4	36x4
Spaulding, G	Road	1600	2	28.90	120	36x4	36x4
Spoerer, 25-A	Run	1900	2	27.25	120	35x4	35x4
Staver, 45	Run	1750	2	32.40	113	34x4	34x4
Staver, 45	Road	1750	2	32.40	113	34x4	34x4
Staver, 45	Tour	1750	5	32.40	113	34x4	34x4
Staver, 45	Semi-racer	1750	2	32.40	116	34x4	34x4
Staver, 45	Fore-door	1750	2	32.40	116	34x4	34x4
Staver, 45	Tour	1750	5	32.40	116	34x4	34x4
Stoddard-Day., 30	Road	1350	2	25.00	112	34x4	34x4
Stoddard-Day., 30	Tour	1450	5	25.00	112	34x4	34x4
Stoddard-Day., 38	Road	1750	2	28.90	114	35x4½	35x4½
Stoddard-Day., 38	Tour	1850	5	28.90	114	35x4½	35x4½
Studebaker, 30	Coupe	1475	5	25.60	112	32x3½	32x3½
Studebaker, 35	Coupe	1850	2	27.25	115½	34x4	34x4
Studebaker, 35	Tour	1290	6	27.25	115½	34x4	34x4
Studebaker, Six	Road	1550	2	29.40	121	34x4	34x4
Studebaker, Six	Tour	1550	6	29.40	121	34x4	34x4
Velie, Dispatch	Road	1450	2	22.50	113	34x4	34x4
Velie, Dispatch	Tour	1500	5	22.50	113	34x4	34x4
Velie, 32	Tour	1350	5	22.50	113	34x3½	34x3½
Warren, 30	Road	1250	2	27.25	110	34x4	34x4
Warren, 30	Tour	1250	5	27.25	110	34x4	34x4
Warren, 40	Tour	1415	5	27.25	110	34x4	34x4
Westcott, 40	Tour	1975	5	32.40	120	36x4	36x4
Westcott, 40	Torpedo	1975	4	32.40	120	36x4	36x4
Westcott, 40	Road	1975	2	32.40	120	36x4	36x4
Zimmerman, Z-40	Tour	1600	5	30.75	116	35x4	35x4
Zimmerman, Z-46	Tour	1950	5	33.75	128	36x4	36x4

Automobiles Costing from $2000 to $2999

Name and Model	Body	Price	Seats	S.A.E. H.P.	Wheel-base	TIRES Front	TIRES Rear
Abbott-Detroit, E	Tour	$2000	7	32.40	121	36x4½	36x4½
Abbott-Detroit, E	Road	2150	2	32.40	121	36x4½	36x4½
A.E.C., 6-45	Tour	2500	5	33.75	130	36x4½	36x4½
A.E.C., 6-45	Road	2500	2	33.75	130	36x4½	36x4½
Alpena, N-6-50	Road	2200	2	33.75	135	36x4	36x4
Alpena, N-6-50	Tour	2250	4	33.75	135	36x4	36x4
Alpena, N-6-50	Tour	2250	5	33.75	135	36x4	36x4
Alpena, N-6-50	Tour	2390	6	33.75	135	36x4	36x4
Alpena, N-6-50	Tour	2390	7	33.75	135	36x4	36x4
Amer. Tour, 34A	Tour	2350	4	32.40	118	37x4	37x4
American, 32A	Road	2350	2	32.40	118	37x4	37x4
Apperson, 4-45	Coupe	2100	4	32.40	114	34x4	34x4
Apperson, 4-55	Tour	2000	5	36.10	118	36x4	36x4
Apperson, 4-55	Tour	2250	7	36.10	122	36x4½	36x4½
Auburn, 40L	Town Car	2500	5	32.40	122	36x4	36x4
Auburn, 6-45	Tour	2000	5	33.75	130	36x4	36x4
Auburn, 6-45	Road	2000	2	33.75	130	36x4	36x4
Auburn, 6-45	Coupe	2600	5	33.75	130	36x4	36x4
Bergdoll, C-30	Limousine	2400	7	25.60	115	34x4	34x4
Bergdoll, 40	Tour	2000	5	25.60	121	36x4	36x4
Bergdoll, 40	Tour	2100	7	25.60	121	36x4	36x4
Bergdoll, 40	Torpedo	2000	4	25.60	121	36x4	36x4
Bergdoll, 40	Road	2000	2	25.60	121	36x4	36x4
Bergdoll, D-40	Limousine	2600	7	25.60	115	34x4	34x4
Burg, R	Tour	2450	5	27.25	134	36x4½	36x4½
Cadillac, 1913	Tour	2075	6	32.40	120	36x4½	36x4½
Cadillac, 1913	Coupe	2500	4	32.40	120	36x4½	36x4½
Carroll, 4E	Road	2250	2	32.40	118	36x4	36x4
Carroll, 4E	Road	2250	3	32.40	118	36x4	36x4
Carroll, 4E	Tour	2400	4	32.40	118	36x4	36x4
Carroll, 4E	Tour	2400	5	32.40	118	36x4	36x4
Carroll, 4E	Tour	2400	6	32.40	118	36x4	36x4
Cartercar, 5	Sedan	2000	5	27.25	116	36x4	36x4
Case, O	Tour	2050	5	32.40	125	37x4½	37x4½
Chalmers, 17	Tour	2150	7	28.90	118	36x4½	36x4½
Chalmers, 17	Coupe	2250	4	28.90	118	36x4½	36x4½
Chalmers, 18	Tour	2400	5	43.80	130	36x4½	36x4½
Chalmers, 18	Tour	2600	7	43.80	130	36x4½	36x4½
Chalmers, 18	Torpedo	2900	4	43.80	130	36x4½	36x4½
Chalmers, 18	Road	2400	2	43.80	130	36x4½	36x4½
Chalmers, 18	Coupe	2700	4	43.80	130	36x4½	36x4½

Name and Model	Body	Price	Seats	S.A.E. H.P.	Wheel-base	TIRES Front	TIRES Rear
Chevrolet, C	Tour	$2100	6	31.95	120	35x4½	35x4½
Cino, 660	Tour	2700	7	38.25	132	36x4½	36x4½
Cino, 660	Road	2700	2	38.25	132	36x4½	36x4½
Coey, A	Tour	2000	4	38.40	128	36x4	36x4
Coey, B	Road	2000	2	38.40	128	36x4	36x4
Colby, E	Tour	2150	7	25.60	128	36x4½	36x4½
Colby, 6C	Tour	2500	7	40.90	138	37x5	37x5
Cole, 50	Coupe	2500	4	32.40	122	36x4	36x4
Cole, 60	Tour	2485	6	40.90	132	37x4½	37x4½
Correja, T & D	Limousine	2300	4	28.90	125	36x4	36x4
Correja, T & D	Limousine	2300	6	28.90	125	36x4	36x4
Correja, S & R	Tour	2150	4	43.80	125	36x4	36x4
Correja, S & R	Tour	2150	5	43.80	125	36x4	36x4
Correja, S & R	Tour	2350	7	43.80	125	36x4	36x4
Correja, S & R	Limousine	2750	4	43.80	125	36x4	36x4
Correja, S & R	Limousine	2950	7	43.80	125	36x4	36x4
Correja, R	Run	2250	2	38.40	125	34x4	34x4
Correja, S	Tour	2250	5	38.40	125	34x4	34x4
Crawford, 13-40	Road	2050	2	32.40	125	36x4	36x4
Crawford, 13-40	Tour	2100	5	32.40	125	36x4	36x4
Crow-Elkhart, C-7	Road	......	2	32.40	122	36x4	36x4
Crow-Elkhart, C-8	Tour	......	5	32.40	122	36x4	36x4
Crow-Elkhart, C-9	Tour	......	7	32.40	122	36x4	36x4
Crow-Elk., C-6B	Tour	......	5	33.75	122	35x4½	35x4
Crow-Elk., C-6A	Tour	......	7	40.90	137	37x4½	37x4½
Croxton, A-4	Tour	2500	4	27.25	121	36x4	36x4
Croxton, D-4	Road	2250	2	27.25	121	36x4	36x4
Croxton, 10	Taxi	2250	......	27.25	121	36x4	36x4
Dorris, H	Tour	2500	5	30.63	121	36x4	36x4
Dorris, H	Tour	2550	7	30.63	121	36x4	36x4
Dorris, H	Tour	2500	4	30.63	121	36x4	36x4
Dorris, H	Tour	2550	6	30.60	121	36x4	36x4
Duquesne, 50	Tour	2500	5	36.10	124	36x4½	36x4½
Duquesne, 50	Road	2500	2	36.10	124	36x4½	36x4½
Flanders, 50	Tour	2200	4	38.40	130	36x4½	36x4½
Flanders, 50	Tour	2250	7	38.40	130	36x4½	36x4½
Franklin, G	Tour	2000	5	25.60	103	32x4	32x4
Franklin, M	Tour	2900	5	31.60	116	34x4½	34x4½
Franklin, M	Run	2800	2	31.60	116	34x4	34x4
Franklin, M	Phaeton	2900	5	31.60	116	34x4½	34x4½
Garford, G-15	Road	2750	2	33.75	128	36x4½	36x4½
Garford, G-15	Tour	2750	5	33.75	128	36x4½	36x4½

THE CLASS of medium-priced cars averaging at $2,500 comprises 219 models manufactured by seventy-nine makers and equipped with 100 different power plants. As in the case of the $1,500 cars, the average S. A. E. horsepower is smaller than in 1912, the reason being the same in both classes of cars.

Only two square motors are found in this class, ninety-eight being long-stroke designs; the average S. A. E. horsepower is 34.3, compared with 35.45 in 1912. The average stroke-bore ratio has been increased 7 per cent., being now 1.209:1, while in 1912 it was 1.13:1. All the motors in this class are poppet-valve designs of the water-cooled type, and four and six-cylinder power plants are almost evenly divided, the former numbering fifty-three and the latter forty-seven. The actual horsepower varies from 22.5 (White GRE) to 48.6 (Pullman 6-66).

The wheelbase has also been lengthened 5.7 inches, being now 125.7 inches. The maximum and minimum wheelbases, however, as actually used in the cars, range over a space of 40 inches; the Franklin G having 103 inches and the Mitchell 7-6 144 inches. The tire sizes, too, cover a wide range. Mercer and Franklin G cars, fitted with 32 by 4-inch tires all around, represent the minimum dimensions in this respect; the new Norwalk car leads by its 38.5 by 4.5-inch wheels.

Twenty-one makers have made the left-hand steer stock equipment and three have made it optional, so that twenty-four manufacturers, or 30.6 per cent. of the whole, offer left-hand control to their customers. This is the largest percentage among the makers of any class. The reason is that the man who buys a car for from $2,000 to $3,000 demands comfort.

As in the $1,500 car class, which also includes seventy-nine makers, the automobiles in this class are rapidly being equipped with electric lighting outfits. As in the $1,500 car class, sixty-three makers out of the seventy-nine use electric lights, but on the $2,500 cars the generator equipment is much more frequent than on the cheaper cars, being used on fifty-seven cars, so that only six makes are fitted with batteries. As for self-starters, visitors of the shows will see for themselves how common this equipment has become for the new year.

Among the various bodies shown, the five-passenger touring cars and roadster designs are about equal in number, the first being represented by fifty-four and the latter by forty-nine makes. There are thirty-three seven-passenger touring cars and thirty-two four-passenger touring cars, and the next place is taken by seventeen coupés. Besides eleven six-passenger touring cars, there are a few limousines, runabouts, landaulets, town cars, sedans, torpedoes, speedsters, phaetons, etc.

While in this class there are eleven new names, including A. E. C., Burg, Carroll, Holly, Moyer, Norwalk and Nyberg, as well as new products of the makers of Hudson, Garford, Flanders and Duquesne, forty makers who formerly made cars selling at from $1,750 to $3,000 have discontinued these cars or have gone out of business altogether. The former include National, Overland, Stevens-Duryea, Studebaker, Halladay, Everitt, Autocar, Amplex, Cutting, Marathon and Warren, etc. Among the companies who have dropped the making of automobiles are the former manufacturers of Corbin, Johnson, Jonz, Otto, and Standard.

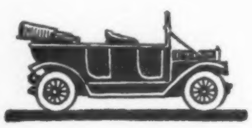
Automobiles Costing from $2000 to $2999

Name and Model	Body	Price	Seats	S.A.E. H.P.	Wheelbase	TIRES Front	TIRES Rear
Glide, 45	Road	$2000	2	36.10	120	36x4½	36x4½
Glide, 45	Tour	2000	4	36.10	120	36x4½	36x4½
Glide, 45	Tour	2150	5	36.10	120	36x4½	36x4½
Glide, 45	Tour	2250	7	36.10	120	36x4½	36x4½
Great South., 51	Tour	2100	6	43.90	128	36x4	36x4½
Great West., 1913	Sedan	2250	4	28.90	118	36x4	36x4
Grout, 35	Tour	2000	5	32.40	116	34x4	35x4½
Grout, 35	Road	2000	5	32.40	116	34x4	35x4½
Grout, 45	Tour	2850	7	36.10	123	36x4	37x4½
Grout, 45	Tour	2750	4	36.10	123	36x4	37x4½
Havers, 55	Road	2250	2	38.40	128	36x4	36x4
Havers, 55	Tour	2250	5	38.40	128	36x4	36x4
Haynes, 22	Tour	2250	5	32.40	120	36x4½	36x4½
Haynes, 22	Tour	2250	4	32.40	120	36x4½	36x4½
Haynes, 22	Road	2250	2	32.40	120	36x4½	36x4½
Haynes, 22	Coupe	2750	3	32.40	120	36x4½	36x4½
Holly, A	Tour	2500	5	38.40	130	36x4½	36x4½
Holly, A	Tour	2500	7	38.40	130	36x4½	36x4½
Hudson, 37	Coupe	2350	3	27.25	118	36x4	36x4
Hudson, 54	Tour	2450	5	40.90	127	36x4½	36x4½
Hudson, 54	Tour	2450	5	40.90	127	36x4½	36x4½
Hudson, 54	Road	2450	2	40.90	127	36x4½	36x4½
Hudson, 54	Tour	2600	7	40.90	127	36x4½	36x4½
Hudson, 54	Coupe	2950	3	40.90	127	36x4½	36x4½
Inter-State	Tour	2750	5	38.40	132	36x4½	36x4½
Jackson, Sultanic	Tour	2500	5	40.90	138	36x4½	36x4½
Jackson, Sultanic	Tour	2650	7	40.90	138	36x4½	36x4½
Keeton, M'brook	Road	2500	2	33.75	131	36x4	37x4½
Keeton, Riverside	Tour	2500	5	33.75	131	36x4	37x4½
Keeton, Tuxedo	Coupe	2850	2	33.75	131	36x4	37x4½
Kissel, 40	Tour	2000	5	32.40	121	35x4½	35x4
Kissel, 50	Tour	2500	6	38.00	132	36x4½	36x4½
Klinekar, 4-40	Tour	2250	5	28.90	118	36x4	36x4
Klinekar, 4-40	Tour	2250	4	28.90	118	36x4	36x4
Klinekar, 4-40	Run	2250	2	28.90	118	36x4	36x4
Klinekar, 4-40	Coupe	2750	3	28.90	118	36x4	36x4
Klinekar, 6-50	Tour	2850	5	26.80	126	36x4½	36x4½
Klinekar, 6-50	Tour	2850	4	26.80	126	36x4½	36x4½
Klinekar, 6-50	Run	2650	2	26.80	126	36x4½	36x4½
Klinekar, 6-50	Road	2800	2	26.80	126	36x4½	36x4½
Lenox, 40	Tour	2000	5	28.90	118	34x4	34x4
Lenox, 40	Speedster	2100	2	28.90	118	34x4	34x4
Lenox, 40	Road	2000	2	28.90	118	34x4	34x4
Lenox, 40	Road	2000	3	28.90	118	34x4	34x4
Lenox, 40	Road	2000	4	28.90	118	34x4	34x4
Lenox, 40	Tour	2000	4	28.90	118	34x4	34x4
Lenox, Six	Tour	2750	6	38.40	130	35x4½	35x4½
Lenox, Six	Limousine	......	6	38.40	130	35x4½	35x4½
Lexington, 13-6	Tour	......	5	40.90	129	36x4½	36x4½
Luverne, 76	Tour	2850	7	43.80	130	37x5	37x5
Marmon, 32	Road	2900	2	32.40	120	35x4½	35x4½
Marmon, 32	Speedster	2850	2	32.40	120	35x4½	35x4½
McFarlan, S	Road	2300	2	38.40	124	37x4½	37x4½
McFarlan, S	Tour	2300	5	38.40	124	37x4½	37x4½
McFarlan, S	Tour	2300	4	38.40	124	37x4½	37x4½
McFarlan, T	Road	2500	2	28.40	124	37x4½	37x4½
McFarlan, T	Tour	2500	5	38.40	124	37x4½	37x4½
McFarlan, T	Tour	2500	4	38.40	124	37x4½	37x4½
McFarlan, T	Tour	2550	6	38.40	124	37x4½	37x4½
McFarlan, M	Road	2750	2	43.80	128	37x4½	37x4½
McFarlan, M	Tour	2750	4	43.80	128	37x4½	37x4½
McFarlan, M	Tour	2750	5	43.80	128	37x4½	37x4½
McFarlan, M	Tour	2750	7	43.80	128	37x4½	37x4½
Mercer, J	Race	2600	2	30.63	108	32x4	34x4
Mercer, K	Run	2700	2	30.63	108	32x4	32x4
Mercer, G	Tour	2900	4	32.40	118	34x4	34x4
Mercer, H	Tour	2900	5	32.40	118	34x4	34x4
Midland, T-4	Coupe	2350	3	32.40	121	34x4	34x4
Midland, T-6	Road	2385	2	38.40	134	36x4½	36x4½
Midland, T-6	Tour	2450	7	38.40	134	36x4½	36x4½
Mitchell, 7-6	Tour	2500	7	43.80	144	36x4½	36x4½
Moon, 65	Tour	2500	5	38.40	132	36x4½	36x4½
Moon, 65	Tour	2500	4	38.40	132	36x4½	36x4½
Moon, 65	Road	2500	2	38.40	132	36x4½	36x4½
Moyer, D	Tour	......	5	38.40	122	35x4½	35x4½
Moyer, F	Phaeton	......	7	38.40	122	35x4½	35x4½
Norwalk, A	Tour	2750	5	38.40	127	38x4½	38x4½
Norwalk, A	Road	2750	2	38.40	127	38x4½	38x4½
Nyberg, 6-45	Tour	2000	5	33.75	126	36x4	36x4
Nyberg, 6-45	Tour	$2000	....	33.75	136	36x4	36x4
Nyberg, 6-45	Tour	2100	7	33.75	136	36x4	36x4
Nyberg, 6-60	Road	2200	2	43.80	128	36x4	36x4
Nyberg, 6-60	Tour	2200	5	43.80	128	36x4	36x4
Nyberg, 6-60	Tour	2200	......	43.80	138	36x4	36x4
Nyberg, 6-60	Tour	2300	7	43.80	138	36x4	36x4
Oakland, 42	Coupe	2500	4	27.25	116	34x4	34x4
Oakland, 6-60	Tour	2400	7	40.90	130	34x4½	34x4½
Oakland, 6-60	Tour	2400	5	40.90	130	34x4½	34x4½
Oakland, 6-60	Tour	2400	4	40.90	130	34x4½	34x4½
Oakland, 6-60	Speed	2400	2	40.90	130	34x4½	34x4½
Palmer-Sing., Six	Tour	2000	5	38.40	127	36x4	36x4
Palmer-Sing., Six	Road	2000	2	38.40	127	36x4	36x4
Pathfinder, 13	Coupe	2500	3	27.25	120	36x4	36x4
Pathfinder, 13	Cruiser	2000	2	27.25	120	36x4	36x4
Pilot, 50	Tour	2250	5	32.40	126	36x4	36x4
Pilot, 60	Tour	2500	5	38.40	132	......	......
Pope-Hart., 31	Tour	2250	5	30.10	118½	36x4½	36x4½
Pope-Hart., 31	Phaeton	2250	4	30.10	118½	36x4½	36x4½
Pope-Hart., 31	Road	2250	2	30.10	118½	36x4½	36x4½
Pope-Hart., 31	Coupe	2850	3	30.10	118½	36x4½	36x4½
Pratt, 50	Tour	2150	4	32.40	122	36x4	36x4
Pratt, 50	Tour	2150	5	32.40	122	36x4	36x4
Pratt, 50	Tour	2300	7	32.40	122	36x4	36x4
Premier, 6-40	Tour	2735	5	38.40	132	36x4½	36x4½
Premier, 6-40	Road	2600	2	38.40	132	36x4½	36x4½
Pullman, 4-44	Tour	2150	5	32.40	122	36x4	36x4
Pullman, 6-66	Tour	2750	7	48.60	138	36x4	36x4
Rambler, Cross-C	Coupe	2500	4	32.40	120	37x4½	37x4½
Rambler, Cross-C	Limousine	2850	5	32.40	120	37x4½	37x4½
Rayfield, C	Tour	2500	5	29.40	117	34x4	34x4
Rayfield, C	Road	2500	2	29.40	117	34x4	34x4
Republic, D	Tour	2350	5	28.90	120	36x4	36x4
Republic, D	Tour	2350	4	28.90	120	36x4	36x4
Republic, D	Road	2350	2	28.90	120	36x4	36x4
Republic, E	Tour	2950	5	43.80	132	36x4½	36x4½
Schacht, NS	Tour	2500	6	28.90	120	36x4	36x4
Selden, 48	Tour	2500	7	36.10	125	37x4½	37x4½
Selden, 48	Tour	2350	5	36.10	125	36x4	36x4
Selden, 48	Tour	2350	4	36.10	125	36x4	36x4
Selden, 48	Road	2350	2	36.10	125	36x4	36x4
S.G.V., A	Run	2500	2	22.50	116	34x4	34x4
S.G.V., A	Tour	2500	5	22.50	116	34x4	34x4
Speedwell, G	Tour	2850	4	40.90	134	36x4½	36x4½
Speedwell, G	Tour	2850	5	40.90	134	36x4½	36x4½
Speedwell, G	Tour	2950	7	40.90	134	36x4½	36x4½
Spoerer, 25-A	Tour	2000	5	27.25	120	35x4	35x4
Staver, 55	Tour	2250	5	32.40	120	36x4	36x4
Staver, 55	Tour	2400	4	32.40	124	36x4	36x4
Staver, 65	Tour	2750	5	38.40	138	37x4½	37x4½
Staver, 65	Tour	2750	7	38.40	138	37x4½	37x4½
Stoddard-Day., 38	Land	2750	......	28.90	114	35x4½	35x4½
Stoddard-Day., 38	Coupe	2350	......	28.90	114	35x4½	35x4½
Stoddard-Day., 48	Road	2700	......	36.10	122½	36x4½	36x4½
Stoddard-Day., 48	Tour	2800	......	36.10	122½	36x4½	36x4½
Studebaker, 35	Sedan	2050	5	27.25	115½	34x4	34x4
Studebaker, Six	Limousine	2500	7	20.40	121	34x4	34x4
Stutz, 4 Bearcat	Road	2000	2	36.10	120	34x4½	34x4½
Stutz, 4 Tour	Tour	2000	4	36.10	124	34x4½	34x4½
Stutz, 4 Tour	Tour	2050	6	36.10	124	34x4½	34x4½
Stutz, 6 Bearcat	Road	2250	2	43.80	124	34x4½	34x4½
Stutz, 6 Tour	Tour	2300	6	43.80	130	34x4½	34x4½
Touraine, 7	Race	2750	2	38.40	114	36x4	36x4
Touraine, 7	Tour	2950	7	38.40	133	36x4	36x4
Touraine, 6	Run	2750	2	38.40	124	36x4	36x4
Touraine, 6	Phaeton	2750	5	38.40	124	36x4	36x4
Touraine, 6	Tour	2750	4	38.40	124	36x4	36x4
Triumph, A	Run	2250	2	36.10	114	36x4	36x4
Triumph, A	Road	2250	3	36.10	114	36x4	36x4
Triumph, B	Tour	2500	5	36.10	114	36x4	36x4
Velie, 40	Tour	2000	5	32.40	118	36x4	36x4
Velie, 40	Tour	2000	4	32.40	118	36x4	36x4
Warren, 50	Resolute	2500	5	38.40	130	36x4½	36x4½
Westcott, 50	Tour	2475	5	38.40	127	37x4½	37x4½
Westcott, 50	Tour	2525	7	38.40	127	36x4½	37x4½
White, GPE	Tour	2500	5	22.50	110	34x4	34x4
White, GRE	Road	2500	2	22.50	110	34x4	34x4

Brain Products

Being a Company-by-Company Story of All 1913 Cars, Listing Their Changes, Lines of Development and the General Tendencies in Chassis and Bodies

By J. Edward Schipper



Practice

¶ In the following pages The Automobile presents its descriptive and illustrative review of the majority of the automobiles listed for the 1913 market. For general conveniences these summaries of changes in design, for such they really are, are in alphabetical order with a few exceptions.

¶ These summaries tell the progress story as exemplified in the 1913 products. Every detail change is not enumerated, but the leading trends are indicated.

¶ There is scarcely a concern that was building in 1912 that has not listed some changes for this year. In spite of the many announcements against annual models it is a fact that such concerns have incorporated changes by way of lighting or starting systems, and in nearly every case there has been an effort to have these changes settled and incorporated in the old models before the commencement of the show circuit.

¶ An exemplary trend in new models with not a few concerns is the aim at standardization of parts for two or more models, so that the same cylinder castings can be used for four or six-cylinder models; besides, the factory operations on corresponding parts in different models are simplified, all with the one aim of decreasing the cost of production.

¶ There has been an avalanche toward starting and lighting systems using electricity, and the installation of such outfits has necessitated not a few motor changes in flywheels, manifolds, camshaft and pumpshaft drives and disposition of timing and motor gears.

¶ Throughout the entire gamut of manufacture there is a pronounced tendency toward reduction in the number of chassis models. With a few there has been a wholesale cutting from four or five models last year to a single one for this season; but again there are a few companies that list more models than last season, due primarily to the introduction of new models without the immediate discontinuance of some of the old ones. The reduction in number of models has made itself conspicuous with several makers of very large outputs, these finding it imperative to reduce the number of models in order to get the output.

Abbott—Adds New Model

There are two Abbotts on the market for 1913. These are the 44-50, which is practically unchanged from last year, and the 34-40, which is a new model. The new model is of somewhat different design from that incorporated in the line for 1912. In the first place, the valve-in-the-head motor has been replaced by an L-head monobloc. Besides this the adoption of the underslung spring construction on all models along with an electric starting device, are added features. The starting system is entirely independent of the electric light generator and magneto. It is designed especially for the Abbott cars and is driven by a current taken from a storage battery which is mounted under the car body near the rear of the frame. This battery has a capacity of 180 ampere-hours. It is charged by the lighting generator. Underslinging the springs all around on all models has made no difference in the appearance of the cars.

Alco—Adopts Disk Clutch

A new dry-plate clutch has been installed in the 1913 Alco. It is of multiple-disk design, the driving disks being faced with high-friction material which bears against driven disks of saw-steel. The new clutch as compared with the one formerly used has seven driving disks against twenty-four; eight driven disks of steel against twenty-five of bronze. The driving pins and lugs are the same in both types of clutches, but when the spring thrust is engaged in the new type the pressure is only 344 pounds against 395 for the old; released, the new 420 against 485. Pressure required on the pedal to release the new clutch is 36 pounds, while under the old system it required 75 pounds. The area of the clutch brake is 8.85 inches against 3 inches before. Aside from that single change in the mechanism, the difference between the current Alcos and those of 1912 consist of body developments and added comforts and luxuries. The curved roof of some of the inclosed bodies, an electric searchlight on the windshield for night touring, artistic doors, slightly wider and trimmer than last year's model even, deeper upholstery, electric

light under the door on the curb side of the body to show the running board when the door is opened, a disappearing window at the back of the front seat in the closed cars, a tell-tale gasoline gauge and a few other details are noted.

Alpena—Adds a Six

A single six-cylinder model will be produced by the Alpena Motor Car Company for 1913. The motor is the Rutenber six-cylinder type, with cylinders 3.75 by 5.25, cast in pairs. The valves are located on the left side, their springs and tappets inclosed by cover plates. The motor is suspended on three points. The clutch is of the faced multiple-disk-in-oil type, the facing being Raybestos. The three-speed selective gearset is located amidships, and drives the floating rear axle through a Spicer shaft. A 135-inch wheelbase and 36 by 4-inch tires are used, the tires being mounted on Baker demountable rims. One spare is furnished. The car is electrically lighted and started by a dynamo and storage battery which also furnish current for ignition. This is the second season that this has been done. Right-hand drive and center control are featured, with nickel trimming throughout. Full equipment is furnished.

American—Better Equipped

Three models of American are known as the Traveler, Tourist and Scout. The use of the underslung construction is to be continued this season. The Traveler chassis comes in two sizes, one with 140-inch wheelbase, the other with 124 inches; 41 by 4.5-inch tires front and rear on demountable rims are used in this model. This is one of the largest wheels on the American market for this season. Small refinements in this model are noticed which may be mentioned, these are, the inclosing of the space between the body and the running boards, housing the forward shackle of the rear springs and more complete equipment. The latter includes specially constructed adjustable mohair top, top booth and curtains, a combination lighting dynamo and electric starter supplying current for all five lights, Warner combination clock and speedometer. The Tourist model continues the same as last year except that the body has been widened 2 inches, pockets have been placed in the tonneau doors, a glove box placed between the two front seats, and electric light installed on the left fender and a license bracket on the right. The former ratchet spark and throttle control has been replaced by one of the friction type. The little Scout is the newest model, and has the fewest changes, these taking the shape of better equipment.

Ames—Uses Bloc Motor

Two models are being put out for the 1913 season by the Ames Motor Car Company. One is a touring model known as the 45 and the other a roadster known as model 44. Both these are mounted on the same chassis. The Continental four-cylinder en bloc motor is incorporated in this design. It has a bore of 4.125 inches and a stroke of 5.25 inches. The cooling circulation is maintained by centrifugal pump. One of the features of the new model is the Gray and Davis electric lighting and starting outfit used in connection with Willard storage battery. The clutch and gearset are a unit with the motor, the casing being integral with the rear end of the crankcase. For 1913 the new Schebler model O carbureter has been adopted. The clutch is of the multiple disk type with alternate disks lined with Raybestos. Control levers are attached directly to the gearset housing giving center control. The drive is by a shaft carrying two Spicer universal joints, one at either end. The pressed steel torque arm is distinct and separate from the drive. The rear axle is floating and the differential is carried on annular ball bearings. A slight improvement has been made in the gasoline tank, which although still located beneath the front seat may be filled without removing the seat cushions, the filler pipe coming up through the glove box in the partition between the two front seats. The bodies on both models are all steel. One of the features of the body is a flush handrail or moulding running all the way round the car. This moulding instead of being fastened to the body with screws is attached underneath the outside covering, thereby securing a perfectly smooth top surface.

Apperson—Abandons Yearly Models

One more firm, that of Apperson Brothers, has abandoned the yearly model idea, producing on the series plan, making improvements as designed without reference to the time of the year. The 1913 series is almost identical with that of 1912. Full equipment is included in the standard price, with the optional features of electric starter and electric lights. The line includes all five of last year's models, three of which are of 45 horsepower and two of which have a 55-horsepower motor. Both motors are of the four-cylinder type with valves on opposite sides and have hollow crankshaft oiling system.

Auburn—Adds a Six

Five models constitute the Auburn line for 1913. Two of these are continuations of last season's models. Two sizes are offered, one the 6-50, a continuation, and the other the 6-45, a new model. Last year's 40-N is this year's 40 L, while the 35 L and the 30 L have been supplanted by the 33-L and the 37 L. No change has been made in the 6-50 except the addition of the Ward-Leonard lighting system as regular equipment. The new six employs a long-stroke motor, 3.75 by 5.5, with valves on the left side. The clutch is of the leather-faced cone type, and the gearset of the three-speed selective variety. A floating rear axle is used, and 36 by 4-inch tires. The wheelbase is 130 inches. The wheelbase on the 40 L is 122 inches, 2 inches longer than on last year's car. The tires this year are 36 by 4

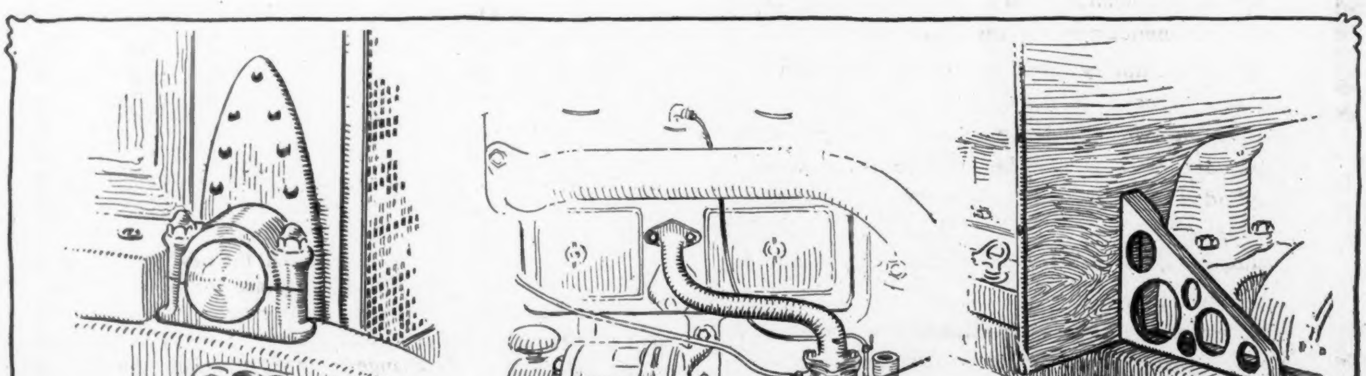


Fig. 1—A, Alco radiator suspension; B, Abbott intake manifold; C, Alco dash bracket

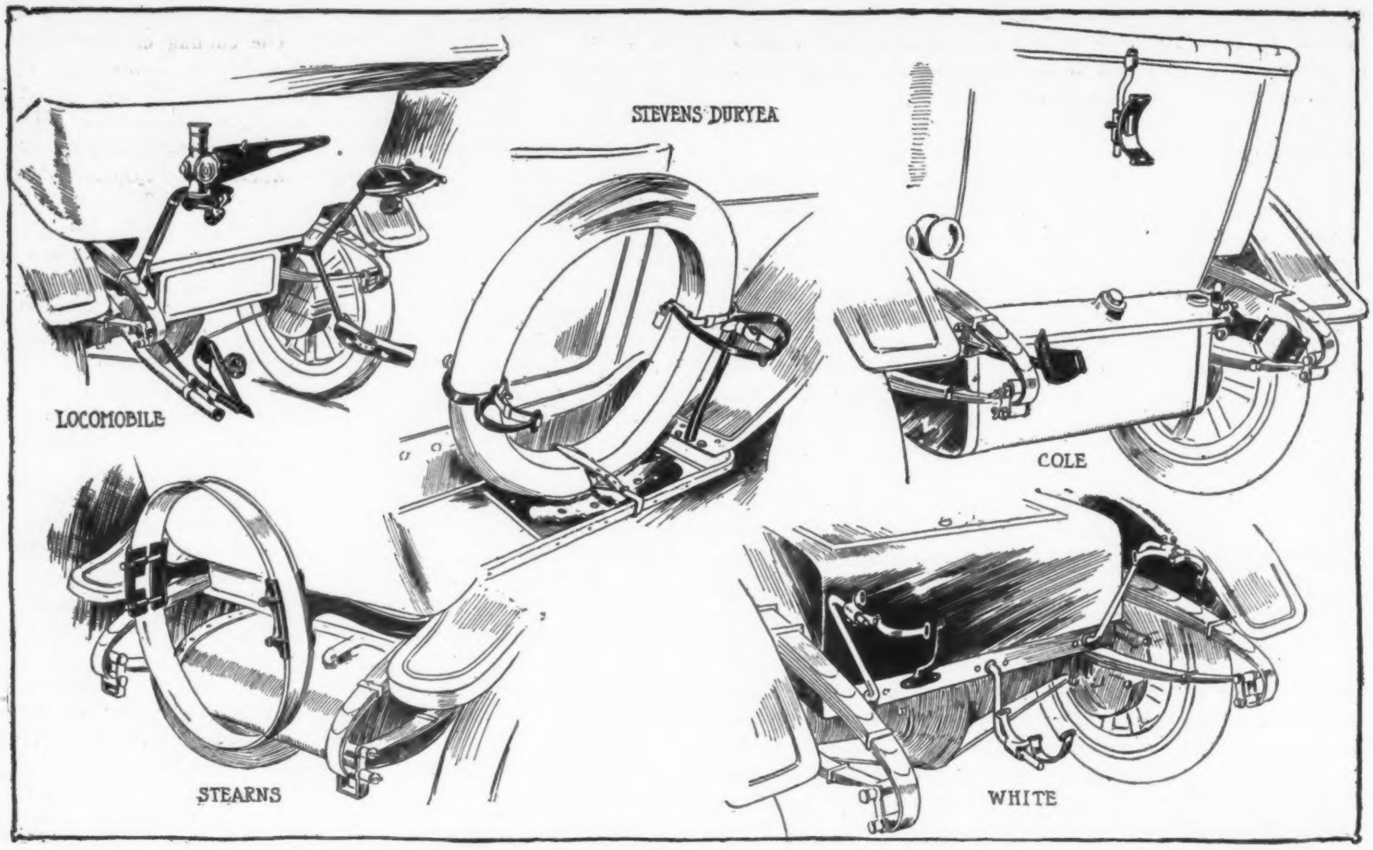


Fig. 2—Rear tire carriers are becoming more popular than ever before

against 37 by 4 in 1912. Model 33 L uses the new Rutenber 3.75 by 5.5 four-cylinder block motor with valves on the left side. A leather-faced cone clutch and three-speed selective gearset are used, the rear axle being of the floating type, on Hyatt roller bearings. The wheels are 34 by 3 1-2 inches all around with a 112-inch wheelbase. Model 37L has a motor 4 1-4 by 4 3-4, of the mono-block type, with valves on the left side. A multiple-disk-in-oil clutch and three-speed selective gearset are included in the unit power plant, and the floating axle is equipped with ball bearings throughout. The wheelbase of this model is 115 inches, and the tires are 35 by 4. The Remy magneto, Schebler carbureter, Rutenber motor and Ward-Leonard electric lighting system are used on all models.

Amplex—Four-Cycle Six

A completely reorganized line has been put on the market for 1913 by the Amplex company. The two-cycle type formerly made under the name of Amplex has been discontinued as a stock production. The new chassis is a six-cylinder with the cylinders cast in pairs. It has a bore of 4.125 inches and a stroke of 5.25 inches. Among the important features on this chassis are the use of the Northeast lighting and starting system and rear axle gearset. It is stated that the Amplex company will shortly bring out a Knight motor.

Austin—Has Two-speed Axle

No marked changes other than the new two-speed Austin axle will be noticed in this concern's line which consists of three models of sixes. This year they are known as the models 77, 66 and 55, they are all supplied with electric starting and light plants, and they appear in their distinctive finish of ivory white and tan. Two-speed axle, which is a decided innovation, has incorporated in its gear a two-speed system. These are a medium direct-drive of 3.5 to 1 and a high direct drive of 2 to 1. This combined with the three-speed gearset gives six speeds forward and two reverse. It is claimed by the makers that a great saving in fuel consumption is retained through the medium of the two-speed action, 50 per cent. more mileage being obtained per gallon of gasoline as compared with medium direct drive. Another point claimed for the two-speed axle is its aid to silent operation, the high-gear ratio eliminating noises caused by low-geared motors on level road.

Bergdoll—Greater Wheelbase

Bergdoll cars for the new season, the 40 Fairmount models in particular, have been greatly refined in appearance and enlarged by the use of a longer frame, the wheelbase, formerly 115 inches being in the new models 121 inches in length. The most notable change, however, is in the adoption of U. S. L. electric starting and lighting system. Motors are of the four-cylinder block type, with cylinders 4 by 5.9375 and 4 by 4 respectively. Equipment is complete on each model, in top, windshield, demountable rims, etc.

Buick—Has Five Models

The 1913 Buick cars are in five models, known as the 24, 25, 30, 31 and 40. Models 24 and 25 are hung on the same chassis, 24 being a roadster and the 25 a touring car. The four-cylinder motor is of the valve-in-the-head type with semi-steel cylinders cast in pairs giving a three-bearing crankshaft. Cooling circulation is maintained by gear-driven centrifugal pump bolted to the crankcase and through brass water manifolds and a vertical-tube radiator. The clutch is an aluminum cone, faced with leather, and transmits the power to a three-speed selected gearset running on annular ball bearings. The steering gear is the semi-irreversible split nut-and-worm type. Models 30 and 31 have the same chassis; in this case the 30 is a runabout and 31 a touring car. The motor in this case is a unit with the clutch and gearset. It has four cylinders of the valve-in-the-head type, and a bore-stroke ratio of 1. The cylinders are of semi-steel analysis and the crankshaft is carried on three bronze-backed babbitt-lined bearings. The clutch is an aluminum cone faced with leather with spring beneath to prevent harsh action. A three-speed sliding gearset is used and is carried on annular ball bearings. Model 40 Buick has a block motor without valve

cages, the valves being carried in the head. Three-bearing crankshaft is also used in this motor. In general design this model is similar to the other Buicks, having the leather-faced cone clutch, three-speed gearset, direct drive to bevel gear in the differential, semi-irreversible split nut and worm steering gear, and right drive and control.

Cadillac—One Chassis, Seven Bodies

One Cadillac chassis upon which seven styles of body may be mounted is on the market for 1913 and, although to external appearance the motor presents the general Cadillac features of design, a number of mechanical changes having been made. The stroke has been increased from 4.5 to 5.75 inches, while the bore remains at 4.5 inches. The horsepower has been increased from 18 to 25 per cent. owing to this change, althongh according to the S. A. E. rating it still remains at 32.4. The makers claim the motor develops from 40 to 50 horsepower on the block. As would be expected from an increase in the cylinder dimensions a number of increases in other dimensions throughout the motor may be expected. This is so. The principal points of increase has been in the camshaft, which has now a diameter of 1.1875 inches in place of .75 inch. It is mounted on three bearings now instead of on five, the greater diameter giving the greatest stiffness and thereby allowing of a larger stand between bearings. Other points of increase are the crankshaft wristpin and connecting-rod bearings. Silent chain replaces the spur gears in driving the camshaft. Lubrication remains the same, the splash system being used. Separate copper waterjackets are used on the cylinders, while the radiator consists of 147 seamless copper tubes which pass vertically through 135 horizontal copper plates. The Delco electrical system is used. Improvements have been made in the latter, however, in the shape of minor refinements, such as concealed wiring, fuses and a Yale lock on the ignition switch. The wheelbase has been increased to 120 inches in place of 116 inches. A cowl is used on all the new open bodies in place of the dash, and all the open bodies are made of sheet steel; closed bodies are aluminum.

Cartercar—Bigger Motor

Model 5 Cartercar has been put on the market for 1913. Four different types of body are mounted on this chassis and all have a new electric starting and lighting system, and the following improvements: The motor has been made higher and narrower and now has a bore of 4.125 inches and a stroke of 4.75 inches. The valve action is on the left side and three-point suspension is used as before. The gasoline tank is in a new position. This year finds it placed beneath the cowl of the dash rendering it possible to lower the body on the frame and to raise the carbureter much higher. The tank is filled from in front of the windshield and is fitted with a gauge which is visible from the driver's seat. Lubrication system has been modified, the oil reservoir being enlarged, and a better shape given the crankcase. A new type of plunger pump is used to circulate the oil. The friction on the drive members of the friction gear can be altered by removing the front footboard, loosening a nut and screwing down a bolt. A one-piece windshield has been placed on the touring and roadster cars. Top straps are fastened to the dash and not to the frame at the lamp brackets as heretofore. Seat springs are built higher in front than in rear to prevent passengers from being thrown forward. Springs are of the double-deck type. Full equipment is fitted on all cars.

Case—Adds New Four

Two models of Case will be on the market for 1913, the model 30, which is entirely new, and the model 40, which was on the market last year, but which has been improved in many respects. The model 30 has a four-cylinder 4.125 by 5.25-inch motor, Westinghouse electric lighter and starter, Remy magneto, Rayfield carbureter, floating rear axle, demountable rims, fore-door ventilators, and a 115-inch wheelbase. The running boards on this

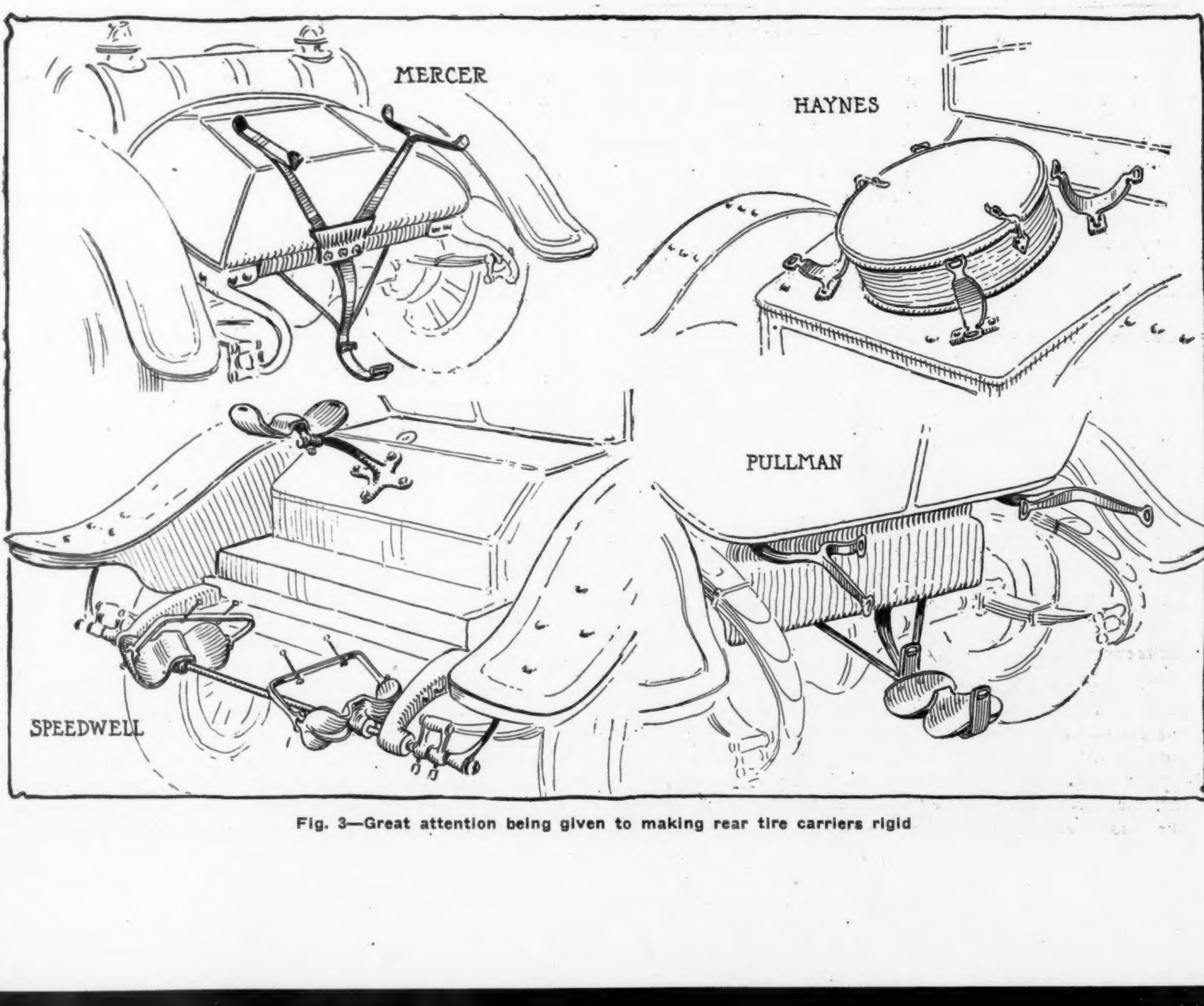


Fig. 3—Great attention being given to making rear tire carriers rigid

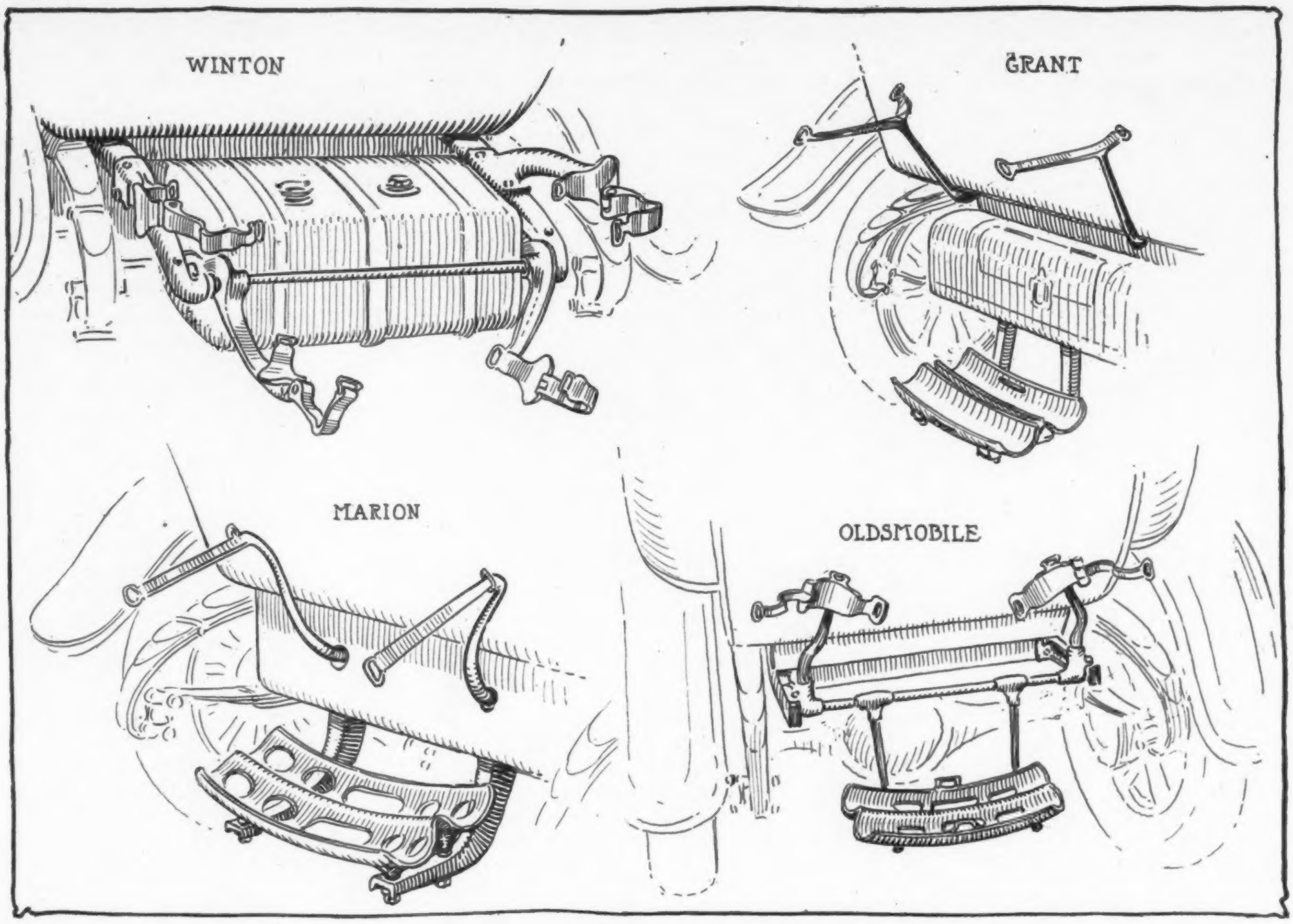


Fig. 4—Rear tire carriers often made integrally with chassis frame

model are absolutely clean, the extra 34 by 4-inch tires being carried on brackets in the rear. The design of this car is similar to the 40 in its improved state. The same 4.5 by 5.25-inch motor is used as last year, but the wheelbase has been increased to 124 inches, whereas last year it was 120 inches. The wheels are now 37 by 4.5 inches instead of 36 by 4. The rear springs are underslung, a Westinghouse electric starting system has been added, Remy dual takes the place of Remy single ignition, pressure gasoline system is used in place of gravity, and the equipment has been rendered more complete.

Cameron—Makes Four Models

Air cooling continues to be the feature of Cameron cars. Four models are produced, as last year, styled 28, 29-A, 30 and 32. These designations refer to body styles, models 28 and 29-A being a two-passenger runabout and five-passenger touring car, respectively, mounted on the same four-cylinder chassis. Models 30 and 32 are corresponding bodies on the six-cylinder chassis. Model 28 has a wheelbase of 104 inches; model 29-A, 110 inches; model 30, 114 inches, and model 32, 130. The valve-in-the-head, individually-cast, air-cooled motor, the cone clutch, the full elliptic springs in the rear, the Cameron transverse, direct-drive rear axle gearset and floating axle are all retained, as formerly.

Chalmers—Adds a Six

Three models of Chalmers cars are now on the market for 1913. Two of these are fours and the other is a six. This is the same as last season and the changes made have been all of a minor nature, reduction in price being the most important. The cylinder dimensions of the three models are the same as last year, the bores of the three models being 4.25 inches for the four and the six, while the strokes are 5.25 for the six and larger four, and 4.5 inches on the smaller four. Monobloc castings are used in the four-cylinder models, while the six uses two groups of three. A slight change in the air-starting system consists in the installation of Kellogg pumps to take the place of the cylinder check valves used to take the pressure from the cylinders and convey it to the storage tank. The transmission service brake has been omitted in the smaller four this season and both brakes placed upon the rear wheels. More luxurious upholstery, sheet steel bodies, long cowl dashes and seats to which a pitch of 2 inches is given form some of the other refinements worth of comment. The Gray & Davis lighting system is used in these cars which are fully equipped.

Chevrolet—Has New Six

The Chevrolet 40 of 1913 is a six-cylinder car with motor composed of two block castings containing three cylinders each. The measurement of the cylinders is 3.5625 by 5 inches. It is of the T-head type and the valves are 2.25 inches in diameter. The pistons are convex. Connecting-rods of I-beam forging equipped with die-cast babbitt bearings. The crankshaft is a drop forging with counterweights forged integrally with the shaft. The four main bearings are of babbitt metal, as are also those of the camshaft. Lubrication is by automatic and mechanical oiling system. The carbureter is heated from the exhaust and is automatic in its action. Dual magnetos are used in ignition. The clutch is leather-faced cone type with adjustable compensating springs. The gearset provides for three selective speeds forward and reverse. Cooling is by centrifugal pump and belt driven fan. The front axle is a drooped forged I-beam and the rear is of the full floating type. Sixteen-inch drums are used for the brakes. Three-quarter elliptic springs are used in the rear with semi-elliptics in front. Steering is by worm and gear. The car has an electric generator for lighting and is

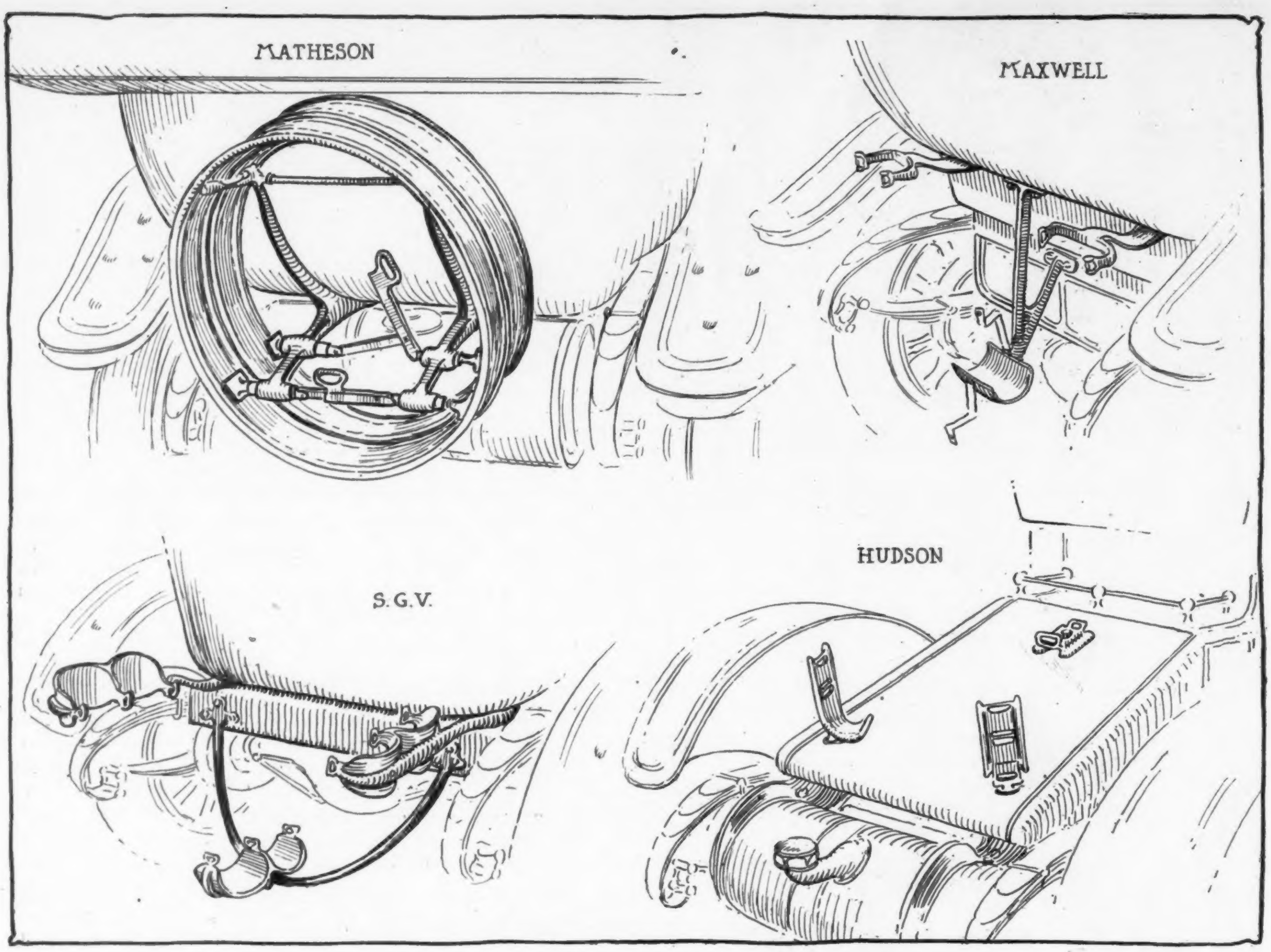


Fig. 5—Accessibility and sightliness favor rear carriers

equipped with a pneumatic starter. Wheelbase is 120 inches with standard tread.

Correja—Puts Out a Six

A six-cylinder Correja has been added to the line for 1913. On this model the cylinders are cast in pairs, are of the T-head type, and have a bore of 4.5 inches and a stroke of 5 inches. The car is rated at from 55 to 60 horsepower and ignition is taken care of by a Simms high tension magneto with a set spark. Carbureter is the new model O Schebler with concentric jets. Lubrication is taken care of by gear-driven pumps which deliver the oil through a hollow crankshaft; the oil being carried in the lower part of the crankcase. A cone clutch with flat springs under the leather casing is used and delivers the power to a three-speed selective gearset located on the rear axle. One universal joint is used in the propeller shaft, this being of the double type and located at the forward end. It is inclosed in a torsion tube. The rear axle is floating and has a removable housing cover through which the differential gears may be examined and adjustments made. Three-quarter elliptic springs, 44 inches in length are used in the rear and semi-elliptic springs in the front. The brakes are mounted on the rear wheels operating on pressed steel drums and equalized by differential levers.

Cole—Adopts a Six

For the 1913 season the series 8 Cole is now on the market. A new six-cylinder, 55-horsepower car is the greatest innovation for this season. It has a bore of 4 1-8 inches and a stroke of 4.75 inches, with a rated horsepower of 55. The other two models, known as the 40 and 50, have four cylinders. The smaller has a bore of 4.125 inches and a stroke of 4.75 inches, while the 50 has a bore of 4.5 inches and the stroke 5.25 inches. The motors are all of Northway manufacture and are of unit construction, the gearset and clutch housing forming the rear portion of the structure, and so arranged as to give the rear support in a three-point suspension. Some of the other features of Cole construction for 1913 are the gas pressure feed with small plunger pump driven off camshaft, leather disk drive for generator, ventilating attachment on windshield, air control on steering column, 4-inch longer rear and 2-inch longer front springs, gasoline gauge on tank having 21-gallon capacity and rear tire holders. Cylinders are of L-head type and are mounted on an angle of 2 1-2 degrees to the vertical, producing a straight-line drive when the car is loaded. There are no radical features of design about the motor, although the external shafting has been so arranged as to incorporate the Delco starting and lighting system. The motor generator is located on the right side of the motor and is driven through one of the gears of the timing set. The Cole automobile is one of those upon which no starting crank is carried, the latter being kept in the tool box for use in case of emergency. Rakish and gracefuly body designs distinguish the Cole line for 1913. Not the least noticeable feature is the polished cowl board carrying the speedometer, sight-feed, pressure gauge, switch and starter.

Crane—Has New Six

This is a new car which has just been placed on the market. It is made in one chassis embodying a six-cylinder motor having a bore of 4.375 inches and stroke of 6.25 inches. A direct force feed system of lubrication is used, the oil being delivered to the main bearings under 3-pound pressure. A single disk clutch, four-speed gearset, transmission brake, floating axle,

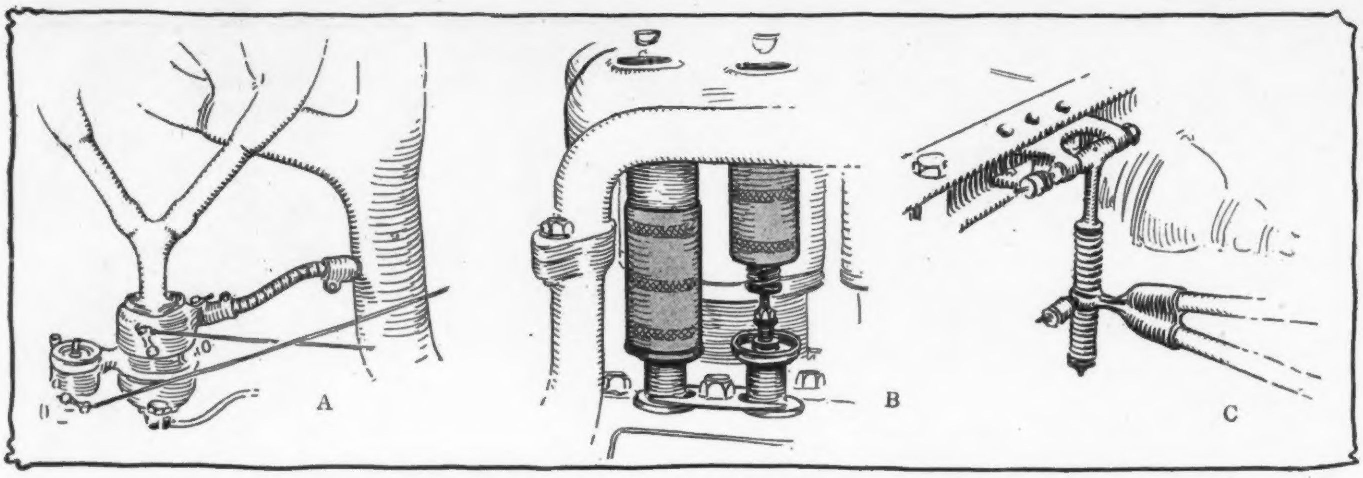


Fig. 6—A, Buick hot-air carbureter jacket; B, Cadillac valve action covers; C, Cadillac torque connection

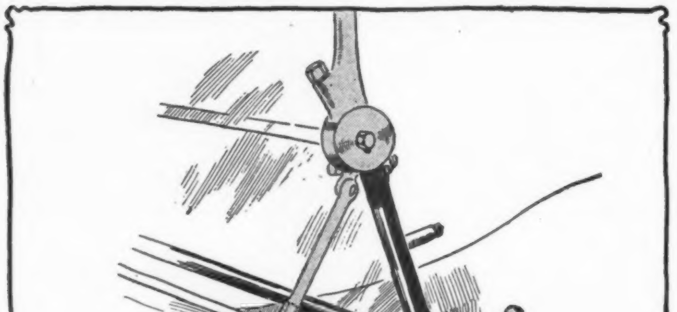


Fig. 7—Cole ventilating shield attachment

chrome nickel steel frame are among the prominent features of the car.

Simplex—Makes Three Chassis

As before, the Simplex Automobile Company will produce three chassis with bodies to order. Two of the chassis offered last year are continued with no mechanical alterations whatever, although a generator electric lighting system has been installed in all models. The 90-horsepower model will be continued in small quantities for those who demand great power, and in its place a chassis practically identical with Louis Disbrow's Simplex Zip has been installed in the line. This model has flat springs and sets much closer to the ground than former Simplex productions. The cylinders, four in number, are 5 3-4 inches square, and, while this engine is allowed 53 horsepower by the S. A. E. rating, it is said to develop 90 on the brake. This model is chain-drive, and will be furnished either as a chassis or in a racy two-passenger roadster. It will be remembered that the other models are a 38-horsepower, shaft-driven chassis with a 4 7-8 by 6 1-2-inch motor and two wheelbases, 127 and 137 inches, respectively; and a 50-horsepower, chain- or shaft-driven chassis, with four cylinders 5 3-4 square. This chassis has wheelbases 129 and 139 inches, respectively. While the bore and stroke of this motor are the same as the new model, the latter motor differs in design, notably in the size of the valves, which are the same as used in the 90-horsepower model, thus deriving its additional power. The new model is termed the 75. The Simplex body policy will be continued. This policy is to furnish bodies partially finished on each chassis, which are carried out in detail to suit the individual preferences of the purchaser, at his order. An especial body production is a semi-steam-line coach limousine with a curved roof and sloping hood.

Crow—Adds a Six

Five chassis and nine body models constitute the 1913 Crow line. The horsepower ratings of these models are 25, 33, 35, 45 and 50, the last mentioned is an entirely new design and is known as the C-6. It has six cylinders and is equipped with both roadster and touring bodies. The smaller two models have four cylinders and are monobloc castings. The exhaust and water manifolds are cast integrally with the cylinders in the case of these two. The four-45 as well as the new six-cylinder models are all of the L-head type with the cylinders cast in pairs. Cooling in all models is accomplished by the thermo-syphon system, and the radiators are mounted on trunnions. Ignition is by a Briggs dual system. Some of the new features included for this season are the gasoline gauge for the gas tank placed under the left front cushion, the arrangement for carrying dry batteries by means of a wooden drawer, and a space for the storage of tools and a compartment to the left of the tank. Baffle plates are placed in the gasoline tank to prevent the fuel from splashing back and forth. The wheelbase on the new six-cylinder car is 137 inches and it is equipped with 37 by 4.5 wheels with demountable rims all around. A feature on the Crow car which is interesting in view of the large number of automobile thefts recently, is the lock on the control set. A small boss is cast on the H-plate and on the gearshift lever. These bosses are pierced by a 3-8-inch hole, making it possible to fit a padlock to the gearset, holding it in neutral position and rendering it impossible for anyone to engage the gears unless provided with a key. The center control was used on the 1912 cars and the cane handle gearshift lever is also used, the ball on the top of the lever being 1.5 inches in diameter. The distance through which the gearshift lever has to be moved is very short.

Cunningham—Makes One Model

One model, a four-cylinder type, is placed on the market for the 1913 season by the Cunningham company. The bore and stroke are 4.75 x 5.75 inches. The cylinders are of the valve-in-the-head type and are offset from the crankshaft. A three-speed gearset, cone clutch with cork inserts, floating axle and screw-and-nut steering gear are other features. An electric starter and generator are regular equipment.

Cutting—Adopts Unit Plant

Two up-to-date styles of body, a roadster and touring car, are now fitted to the single Cutting chassis on the

market for 1913. Although the basic principles of construction are the same this season as last, some important refinements have been made. Among these are the adoption of the unit power plant with three-point suspension. Other prominent features are increased wheelbase, demountable rims, 36-inch wheel on all models, electric side and tail lights, gas headlights, roomy metal bodies and acetylene starter. Roadster and touring car bodies are interchangeable. The four cylinders are cast in one block and have a bore of 4 inches and a stroke of 5 inches. Lubrication is by force-feed through a hollow crankshaft direct to the main and connecting-rod bearings. The connecting-rods do not dip into the oil in this system of lubrication. The force feed given by the pump, which is driven off the crankshaft, is relied upon to furnish a sufficient supply of oil for all the bearings throughout the motor. Timing gears receive their oil from the crankshaft gear which runs in a pocket that is always kept full of lubricant. The clutch is of the dry-plate disk type, the disks being seven in number and composed of cast iron. The oil pump is of the gear type. A three-speed gearset is used, and the axle is floating. Full electric lighting and starting are furnished at extra cost.

Davis—Adds Larger Model

Continuing Model 40 in series A, the Davis Motor Car Company announces a new model, larger than the first. Model 50 A is built along very similar lines to the 40 A, but employs a 50-horsepower Continental motor. The older model shows several improvements over the original design. The wheelbase has been lengthened from 112 inches to 118 inches, and the equipment amplified by the addition of a Gray & Davis lighting system, with a Disco starter, with option of the Gray & Davis starter. The new 50A uses a Continental 4.5 by 5.5-inch motor with cylinders cast en bloc. Otherwise it is identical with the smaller car. A Stromberg is used. Bodies include five-passenger and four passenger touring bodies and a two-passenger roadster with a streamline rear deck. Refinements in the bodies have been made throughout the line of touring cars.

Detroiter—Better Finish

No changes have been made in the Detroiter car for this season except minor refinements and betterments in finish. The motor is of the block type, in this car, with the intake manifold passing through the casting between the center cylinder. The bore of this motor is 3 3-8 inches and the stroke 4 3-4 inches. Three-point suspension, inclosed valves, multiple disk clutch, thermo-syphon cooling and spiral timing gears are among the other features. Left drive and center control are also incorporated, together with the long cowl and straight-line body of accepted design.

Dorris—Refined Motor

Fundamental design has undergone no change in the Dorris cars for 1913, unit construction in the 4.375 x 5-inch four-cylinder valve-in-the-head power plant still being retained. The motor changes are in a better valve action, a three-way sight feed on the oiling system and an additional gear on the timing set to take care of the Apple dynamo-motor for electric lighting and starting. The clutch, gearset and rear axles disclose no change. Six inches have been added to the wheelbase, making it now 121 inches, and the flush-sided body with the cowl dash has been adopted.

Edwards—Uses Knight Motor

One of the newest American cars is the Edwards-Knight, which was announced less than a month ago and which was described in detail in these columns, issue of December 12. In addition to using the Knight two-sleeve motor the car has numerous other constructions, many of which are incorporated in the latest European models. Among these details are detachable wire wheels with Q-D rims, with wood wheels optional; and Lanchester type of rear spring in which the weight of the spring is carried on the frame and so reduces the dead weight on the axle. The motor has a new non-splash forced-feed system of oiling in which the throttle controls the oil pressure, which ranges from 2 pounds with practically closed throttle to 20 pounds with the throttle open. It is one of the few cars to use forged connecting-rods of round section with the insides drilled out to reduce weight, leaving a wall thickness of .125 inch. The U. S. electric flywheel starter is fitted, and the motor carries a Simms magneto and S. U. carbureter. In the transmission system the multiple dry-disk clutch and gearset are in the gearbox in separate compartments. The clutch is in the front part. The rear axle is worm-

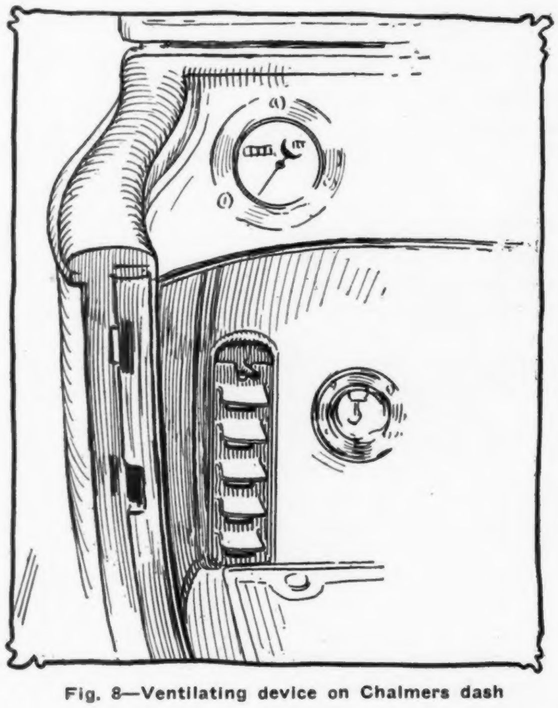


Fig. 8—Ventilating device on Chalmers dash

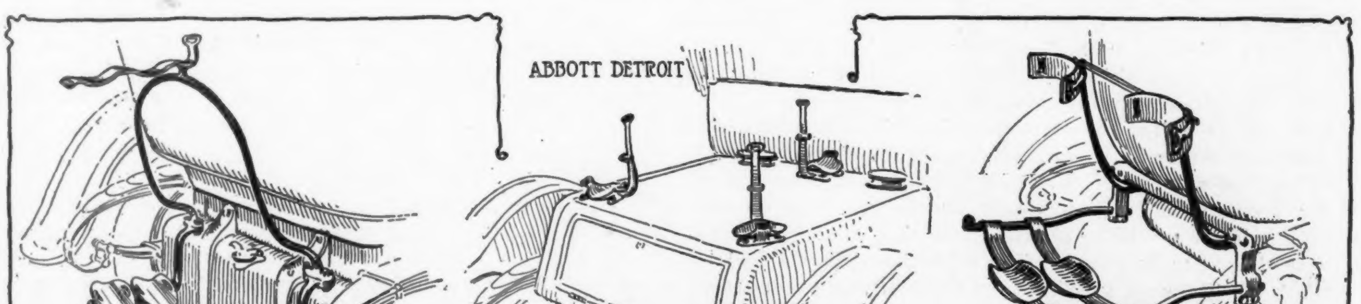


Fig. 9—Three distinct types of rear tire carriers which give rigidity

driven with the worm underneath, yet affording an axle clearance of 9.25 inches. The axle is a Timken construction fitted with worm and worm wheel made by David Brown, of England. It is a straight type worm carried on Timken rollers, which bearings also take up end thrust. The car has straight-line drive in that both motor and gearbox are mounted to decline rearward at an angle of 4 deg., so that with the car loaded the crankshaft, gearset shaft, propeller shaft and worm shaft align. The propeller shaft has two universal joints, two radius rods take the driving action of the rear axle, and in addition there is a torque tube. The radius rods, torque tube and propeller shaft are so designed that there is not any slipping of the universal joints and by having the same angle of drive through the front universal as through the rear one, the retardation and acceleration which occurs twice in each revolution of the joint is neutralized. Various body types are mounted on the same 120-inch chassis. It has left-hand steering and center control with a double-dropped frame.

Empire—Uses Unit Plant

Larger, more powerful and more complete in every particular the Empire car appears for 1913 in Model 25, a big brother to the former 20. This model was announced early in June. The design embodies the features of an inclosed unit power plant, with cylinders cast in pairs, 3.5 by 4.5 inches bore and stroke. The valves are all on the left side, their mechanisms inclosed in cylindrical individual housings. The crankshaft is supported on three bearings and lubrication is by the circulating-splash system. Fixed adjustment is used in the Eisemann high-tension single ignition system. Thermo-syphon cooling is employed. The car is steered from the right side, and the control lever is in the center. A five-passenger touring body with fore-doors is fitted.

Enger—Encloses Valve Action

Models F, J and E of Enger cars are continued, while a new model P has been announced for the present season. The new model differs little mechanically from models F, J and E, using the same 4.5 by 5.25-inch motor with inclosed valves arranged on the left side. An especial feature is the means of closing the valve chambers. The cylinders are cast in pairs, and the valve chamber of each pair is covered by a single plate which carries the spark-plugs and pet-cocks, and which, when removed, permits ready accessibility to the valves. Multiple-disk clutches, three-speed selective gearsets and floating axles are used on all models. Model P is fitted regularly with the North East electric lighting and starting system, all models being equipped with a top and envelope, windshield, speedometer, horn and tools. All models are listed with full equipment.

Fiat—Adds Large Four

The American as well as the foreign Fiat is built in three chassis models, the parts in the American factory being made from the foreign drawings and superintended by foreign engineers so that the domestic and foreign models are duplicates in respect to design, material and workmanship. To the four- and six-cylinder models of last year a large four has been added which coincides in nearly every respect with its two predecessors. These chassis are characterized by block cylinder castings with a transverse front end shaft to drive the magneto and water pump, four-speed gearbox and combined pressed steel rear axle and torque tube, in which two stampings constitute the entire housing, these two being specially light, their total weight in the rough being but 80 pounds. The motor has a forced-feed non-splash oiling system, supplied from an exceedingly compact gear pump mounted on the rear end of the camshaft and delivering its oil through a large diameter conduit, incorporated within the crankcase when cast, from which conduit the three crankshaft bearings are supplied. The crankshaft throws and crankpins are drilled and the connecting-rods carry copper tubes to convey the oil to the wristpins. The exceedingly compact four-speed gearset is a Fiat feature, the total length between bearings being but 10 inches. The new tour has a compression release fitted. All models carry electric lights, but engine starters are not listed. For the first time all Fiat models have the full-dinner-pail equipment which includes everything that the owner requires. Fiat chassis are internationally renowned for their clean-cut appearance; every detail has been designed for its duty and place and looks the part. An example is carrying the magneto control through the crankcase from front to rear thereby eliminating unseemly connections and more fool-proof control. Another example is the clean-cut block casting, with enclosed valve springs and abbreviated manifolds and water connections.

Firestone-Columbus—Electric Starter

Three different chassis are made by the Firestone-Columbus Company. One is a six and the others are four-cylinder models. The six-cylinder motor is cast in groups of three and is of the L-head type with enclosed valve mechanism. Double ignition with two independent sets of spark plugs is used on this model. The wheelbase of this car is 130 inches. The bore of the motor is 4.5 inches and the stroke 5.5 inches. The largest four-cylinder has a bore of 4.5 inches and a stroke of 5.5 inches. Double ignition is used on this also, while on the smaller four dual ignition is used. All models have electric lighting and starting systems, three-speed gearsets and demountable rims.

Flanders—Nothing But Sixes

The Flanders company is another of the increasing number who make nothing but six-cylinder cars. The two chassis put out by this concern are known as the 50-Six and the 40-Six. Both of these cars are newly on the market. The 40-Six has an en bloc motor with a bore of 3.625 inches and a stroke of 4.5 inches. The oil system has a 2.5 gallon capacity, and is of the combination force and splash type actuated by a gear pump driven from the camshaft. The Gray & Davis starting and lighting system has been fitted to this motor as well as to the larger 50-Six. The motor of the latter is also of the block type, has a bore of 4 inches and stroke of 4.75 inches. It is lubricated by the same system as the smaller car and is of the same general design throughout. The control on both models has been arranged so that the gearset lever does not operate with an H-plate, but by a rocking motion. Both the clutch and brake pedals are adjustable. The gearsets have three speeds forward and reverse and are geared 3.5 to 1 on high on the 40-Six and 3.75 to 1 on the 50-Six. A trouble lamp on a longcord, cigar lighter, rear tire irons and hub cap wrench are part of the equipment of both models.

Ford—Heavier Axle

The only important change in the Ford cars for the coming season is in the price, which has been cut since the first of October, 1912. A two-passenger roadster, five-passenger touring car and a six-passenger town car make up the Ford pleasure line. Improvements which have been made in the Ford line consist largely of changes which tend to better the appearance and to increase the comfort of the passenger. The bodies are dropped 2 inches lower and the roadster has been redesigned so that it is now possible to convert the turtle back into a seat for a third passenger. The axle housing has been made heavier.

Franklin—Electric Starting

Electric starting and lighting on the new Franklin series 3, six-cylinder cars is the biggest change presented in this line, which is now listed in series instead of the yearly models. The Entz system which has been installed consists of three parts: an electric motor generator, storage battery and a three-point double-throw switch. The system operates at 18 volts and has the motor generator connected permanently to the crankshaft by a silent-chain drive. The motor-generator is so constructed that it will turn over the motor at low speed, but as soon as the car has picked up speed it will act as a generator and start

charging the battery. The winding employed on this starting system is such that it is a natural function of the motor-generator for it to become a generator after the speed of rotation has mounted to a car speed of 12 miles. Below this speed it performs the functions of a motor. This does away with automatic devices. Another addition to the Franklin line is the little six two-passenger victoria phaeton which has an auxiliary seat in the rear for two, the latter folding into a deck when not in use. Otherwise the Franklin series 3 is the same as series 2.

Garford—Makes a Six

Garford production in the pleasure car line will be confined to one entirely new six-cylinder model in 1913. The car has a construction of 1912 in the essential elements. The car has a wheelbase of 128 inches. Its overall length is 178 inches. The cylinders are of L-head type, the bore being 3.75 inches by 6-inch stroke. Under the S. A. E. formula the rating is 33.75 horsepower, but in the catalogue the motor is called 60-horsepower. The cylinders are cast en bloc with valves on the right side fully enclosed. The crankshaft is a steel forging with four bearings of babbitt-lined bronze. Lubrication is by gear-driven pump with the oiler in the crankcase. Copper tubes lead to the main bearings and oil leads through the crankshaft to connecting-rod bearing and wristpins provide for lubrication of those parts. In addition there is a splash system. High tension ignition with waterproof magneto and battery is installed. The cooling system consists of a honeycomb radiator and fan as last year. A cone-faced clutch with cork inserts, having a face 2.125 inches, is slightly changed from last year. Four speed, selective transmission gives direct on third and final drive is by bevel gear and pinion to floating rear axle; Garford worm and gear steering; Krupp steel springs, three-quarter elliptic in the rear; kick-up pressed steel frame and an electric starter, the motor generator of which takes the place of the flywheel, are some of the details of the new car.

Glide—Adds New Four

An entirely new four-cylinder Glide has been put on the market for the 1913 season. This car, which is known as the 36-42, is being built along similar lines to its predecessor of last year. The improvements incorporated are a 4-inch longer wheelbase, making 118 inches, a larger motor having a bore of 4 1-8 and a stroke of 5 1-4 inches, and larger and heavier parts throughout to take care of the additional weight due to the longer wheelbase and more powerful motor action. The four cylinders are a monobloc casting tested under hydraulic pressure for casting flaws. The valves are all located on the left side of the motor and are covered by cast-iron removable plates to silence their action. The flywheel housing is a unit with the crankcase and is cast of nickel aluminum alloy. Acetylene starters are fitted on the Glide touring and roadster cars, while the lighting system is the Ward Leonard. A motor-driven tire pump is included in the equipment of these cars.

Great Western—One Chassis

Great Western cars are built for the season of 1913 in four body types upon a single chassis model. This chassis is known as the 40, as it has been for the past few years, but this year the motor is larger, the stroke being 5.5 inches in place of 5 inches, while the bore remains 4.25 inches as formerly. A more radical change of design is the placing of the exhaust valves on the side of the motor in a regular L-type construction in place of in the head of the motor, as they were formerly. In connection with the change in the valve location is a new feature in the use of roller valve lifters acting directly on the cams. The valves themselves are cast iron electrically welded to carbon steel stems. The power plant is the unit type with lubrication by splash. The new Remy dual system with concealed coil is also used. A slight change has been made in the clutch in that the angle of the cone has been flattened so that it will act easier. Other features of the car are the floating axle running on a double roll of New Departure ball bearings with Hyatt rollers for the differential and the worm and full gear type of steering. The wheelbase shows an increase of 4 inches over last year's product; it is now 118 inches.

Grant—Makes a Six

One of the new cars to be first seen on the market for 1913 is the Grant Six. It embodies a T-head 50-horsepower Wisconsin motor, a multiple disk dry-plate Grant-Lees clutch and a gearset having three speeds forward made by the same concern. The motor clutch and gearset when assembled make a complete unit power plant. Timken axles are used, and the body is made of three-ply laminated wood. Marvel carbureter, Esterline generator, Gray & Davis lamps, mohair top, Gemmer steering gear and complete equipment are furnished.

Westcott—New Light Six

In line with the present trend in favor of light, medium-priced sixes, the Westcott Motor Car Company announces a six in addition to its continued four. The four differs little from its predecessors, the chief change in mechanical features being the installation of an electric starting and illumination system. The six-cylinder is one of the many new sixes of this season. An aim has been made in its manufacture to effect simplification of structural features following the same general lines laid out in the four-cylinder cars. The motor is cast en bloc, 4 by 6-inch bore and stroke with valves arranged opposite instead of in an L-head as previously. The car is claimed to develop 67 horsepower and to weigh 3,500 pounds, or to have 1 horsepower to every 52 pounds in weight.

Warren—Adds a Six

Continuing its three four-cylinder models and adding a six-cylinder type, the Warren Motor Company enters the 1913 selling season well equipped to meet the demands of all comers. All three of the fours have different cylinder dimensions, none of which correspond to those of the new six, which has a bore of 4 inches and a stroke of 5 inches. The fours are identical in all but the most minor details with their counterparts for last season. The six adheres to the monobloc cylinder construction, the upper part of the waterjacket being cast open. It is covered by an aluminum plate with which the water outlet is formed integrally. The new motor, like the Warren fours, is of the L-head type, valves being located on the left. The crankshaft has three bearings which are anchored to the upper half of the crankcase in the usual way. The support of the engine is at four points on a subframe. Splash lubrication, positive water cooling, double ignition and pressure gasoline feed are features of the six-power plant. It also is fitted with an electric self-starting and lighting system of the Northeast make. The combined motor-generator is mounted on the right side of the engine and connects to the crankshaft by a 1-inch silent chain. It operates either as a motor for starting or a generator for lighting, as the case may be. Control of the car is on the right. The standard body furnished on the new six-cylinder chassis is a metal, foredoor type with swelled back. Door latches being inside, the body is flush-sided, while the bottom line is straight and not cut away to follow the frame drops. Nickel trimmings are fitted, as well as all equipment for immediate road work.

Richmond—Larger Cars

Larger cars are being produced by the Wayne Works for 1913 than for 1912. The same 30 and 40-horsepower motors, of 4 by 4.5 and 4.5 by 5, are used. These motors are of four individually cast cylinders. The valves are located in side pockets on the left side, their springs and lifters inclosed in telescopic tubes. The crankshaft is supported on five bearings. The clutch is of the inverted-cone type with a bronze ring thrust, so arranged that it is bathed in grease upon pressure being applied on it, permitting slippage of the clutch with no harmful results. The three-speed gearset is located behind the clutch, to which it is coupled by a

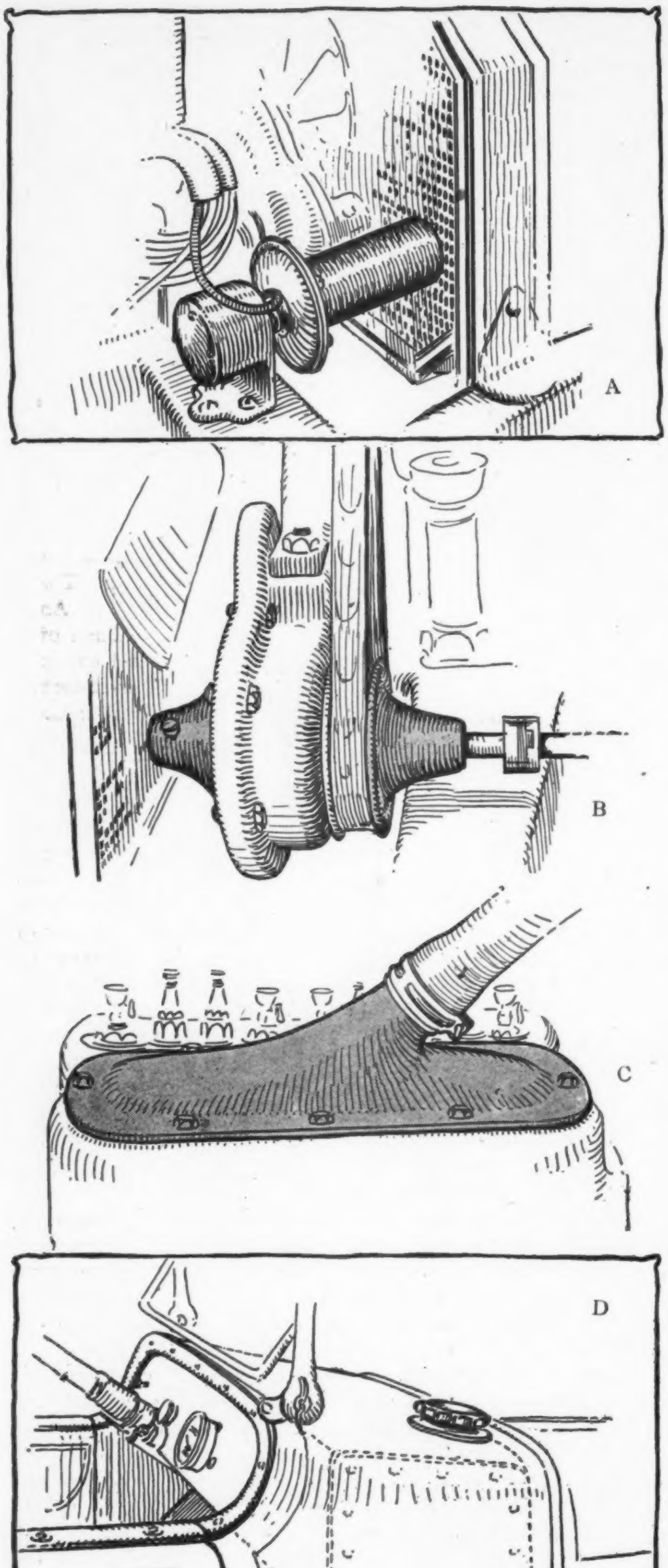


Fig. 10—A, horn on Grant car is attached rigidly to the supporting frame of the motor, the projector being directed through the radiator

B, in order to secure stiffness at the timing gear, the Grant car has a bearing on either side of the gearcase

C, the water manifold and the waterjacket cover are a unit on the Herreshoff car and are removable

D, in order to mount the carbureter as high as possible the gasoline tank is carried under the cowl on the Henderson car

universal joint. Thermo-syphon cooling, formerly supplied on the 40 only, is now provided on both models, and the tubular type of radiator is used. The former dual ignition system has given place to single magneto ignition. A change to Schebler carbureters has been made, and the wheelbase and tire sizes on both models enlarged. Model O, formerly model N, has a wheelbase increased from 106 to 112, and tires from 32 by 3.5 to 34 by 3.5 inches. Model P, formerly model M, has a wheelbase of 120 instead of 112, and tires 36 by 4 instead of 34 by 4. Springs have likewise increased slightly in length. Model P, the 40-horsepower model, is equipped with electric lights, supplied by a dynamo and storage battery. Model O is fitted with an improved foredoor touring car and a Bumblebee roadster. Model P carries a touring car only.

Havers—Only Sixes

No four-cylinder models are included in the Havers line for 1913. Continuing its former six and adding another and larger chassis, the Havers company enters the 1913 season with two sixes. The smaller model is known as the Six-44 and the larger as the Six-55. The former has a bore of 3.75 inches and a stroke of 5 inches, while the latter has a bore of 4 inches and a stroke of 5 inches. On both models the cylinders are cast in pairs and are of L-head design with the valve springs and stems inclosed by aluminum cover plates. Four bearing camshafts, spiral timing gears, combined force and splash-feed oil, thermo-syphon cooling, Northeast starter and lighting, Bosch dual ignition, three-speed gearsets, and floating axles are features of both chassis. Right drive and control are used in the Havers models, which are put up in touring and roadster bodies. The Knickerbocker speedster is worthy of comment in that it is a new effort for the Havers company which believes there is a demand for a machine of raceabout type built along low lines.

Haynes—Adopts Left Drive

A brand new car, model 24, with left drive and left control, distinguishes the Haynes line. The first starting system used by the Haynes company will be on this year's car. It has been designed by the Haynes engineering staff and is of the electric type geared to the flywheel. The alterations which have been made in the model 22, which is a continuation of the model 21, are very slight, the principle one being an alteration of the suspension design. Models 24 and 22 are L-head and T-head respectively, the bore and stroke of the former are 4.25 and 5.5 inches. The oiling system has been changed slightly in this year's models, the pump now being located at the top and outside of the crankcase instead of within it at the bottom. The modification of the spring suspension consists in the attachment of the spring hanger bracket to the end of the frame. The three lowest spring leaves in the upper set have been continued back of the clip for a distance of 3 1-2 inches to act as a stop by striking on the rubber bumper located at the center of the lower half of the spring. In model 22 the frame end is dropped 2 inches lower than in the model 21. The motor has four cylinders cast in pairs, with a bore of 4.5 inches and a stroke of 5.5 inches. The waterjackets are removable at their upper extremity. An Eisemann dual-ignition system is used with a storage battery for starting. The balance of the electric equipment includes the Haynes electric starting and lighting system. The starting system is operated in the seat of the car by first placing the switch on the battery side and then placing a right foot on the brake pedal. With the heel of the left foot a lever on the left side of the chain-gear quadrant is depressed and the change-gear lever brought into the starting slot and pushed firmly and quickly down as far as it will go. When the motor starts the lever is released and springs back into neutral position again. As in the past, the Haynes clutch is of the contracting band type on both models, but instead of using a bronze drum this year the drum is of hardened steel. Right control and right drive are maintained for this year on model 22. The starting crank is omitted on both models. Model 24 has just

been brought out and is newer than model 22, which was announced some time ago. The first cars of this type to arrive in New York City will be those exhibited at the New York shows.

Henderson—Uses Wire Wheels

Four new models, the 45 Roadster and 47, 48 and 49 Touring car have been placed on the market by the Henderson company. The 45, 47 and 49 models are equipped with wire wheels. While retaining the same general features as the previous model 46, touring car, such as gasoline tank on dash, dynamo lighting system and left drive, and using the same motor, the wheel equipment has been altered to suit the new system. An extra wheel is carried at the rear of the car on a false hub. These wire wheels have quick detachable rims of the Marsh type. Models 48 and 49, both five-passenger touring cars, differ from the model 47 in the following respects: Cellular type radiator; combination tail light and license holder; electric dash and trouble light; one-piece windshield with hand holds on bracket and rubber skirt on bottom of shield; Ward Leonard electric starter system; Bosch ignition; clock on instrument board. These bodies will be built on the same standard chassis as 45 and 47 but will be longer bodies with roomier tonneaus, finished in olive green and gray with Turkish upholstering of genuine machine-buffed black and Spanish gray leathers. Model 48 will be equipped with wood wheels of the artillery type, demountable rim and extra rim. Model 49 will be equipped with McCue wire wheels having the Marsh type QD rims and spare demountable wheel. Mechanical features of the Henderson cars are practically the same for all models. The motor is of the block type and has four 4.125 by 5.25-inch cylinders; force-feed lubrication combined with splash; thermo-syphon cooling; Remy dual ignition; Rayfield carbureter, and Ward Leonard lighting system. The gear shift lever placed between the two front seats is retained. The Ward Leonard starting and lighting system is used and has the control handle together with the ignition switch and other dash equipment on a cowl board in easy reach of the operator.

Herreshoff—Makes a Six

Another six-cylinder model to make its first appearance in the 1913 season is the Herreshoff. The motor in this car which is known as the 6-36 is of the T-head type with the cylinedrs cast en bloc and has a bore of 3.375 inches and a stroke of 4 1-2 inches. It is rated by the maker at 36 horsepower and incorporates the three-point suspension feature. A three-bearing crankshaft is used, forged in one piece. The camshaft has also three bearings and is composed of carbon steel. Electric lighting and starting is secured by means of a Westinghouse generator and an 80-ampere-hour storage battery which is wired only to the side and tail lights. The headlights are electric. The wheelbase of this model is 124 inches. Among the other features incorporated in this car are a Herreshoff-Westinghouse electric starter, four-speed gearset, left drive, center control, full platform springs, 34 by 4-inch demountable rims all around with one extra rim, shrouded dash and clear vision windshield.

Hudson—Makes Six and Four

Two brand new chassis, one a six and the other a four, constitute the Hudson line for 1913. The six is known as model 54 and the four as model 37. Both are unlike the 1912 product in every way. The bore of the six-cylinder model is 4.125 inches and the stroke 5.25 inches. The new chassis wheelbase is 127 inches. All types of bodies are fitted to this chassis. Among the prominent features of the six-cylinder car are the cylinders, which are cast in threes, three-bearing crankshaft, pressure feed of oil to timing gears, Zenith carbureter, pressure gasoline feed, and Delco ignition, lighting and starting. Other features about the chassis which are worthy of comment are the use of roller bearings throughout; there are no ball bearings in the car. Longer springs are used on this chassis and 36 by 4.5 tires. The dash equipment differs from last year's in that a

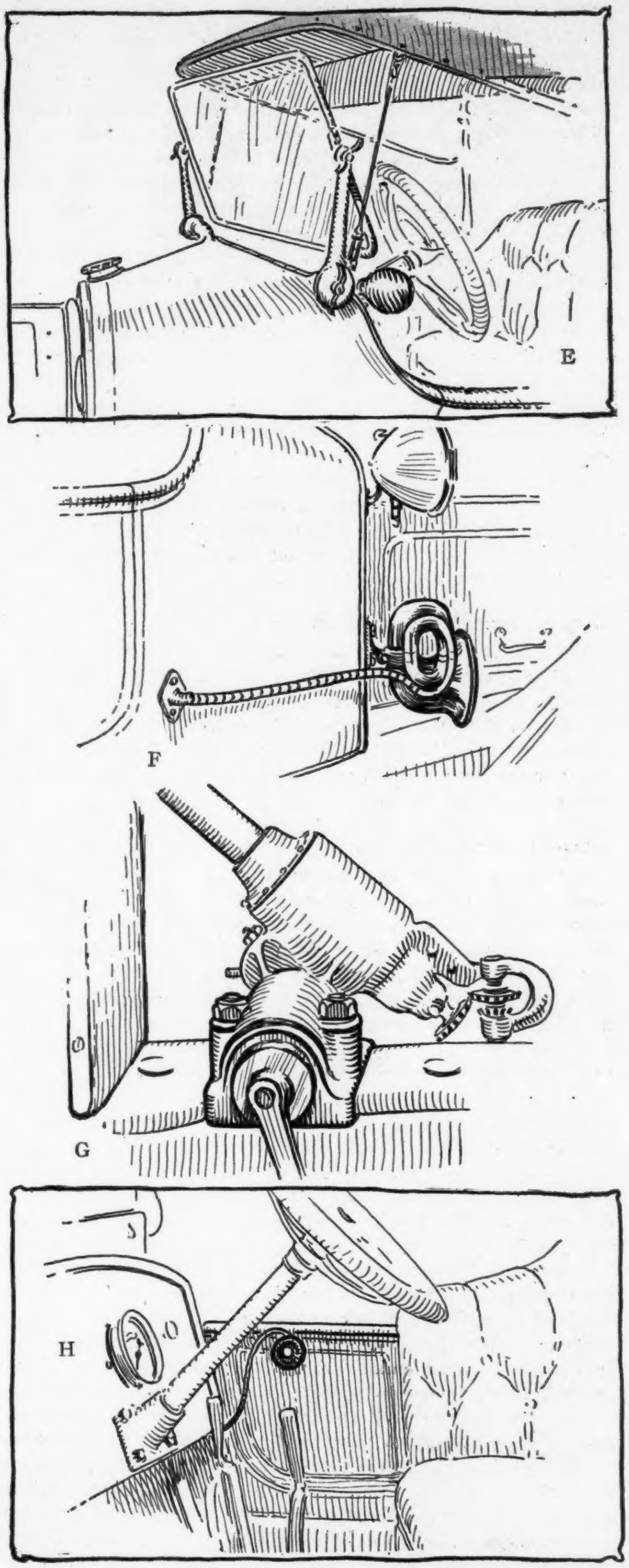


Fig. 11—E, Henderson has done away with the long top strap, fastening same to windshield

F, Hudson has a rigid attachment to the outside of the dash and body for the combination bulb and electric horn

G, Kissel steering gear is mounted on trunnions on the car frame, and is independent of small deflections

H, on the Jackson car the horn pushbutton can be operated by hand or by the knee, leaving hand free for steering. Center control used

speedometer and clock are fitted, and an oil pressure gauge takes the place of the sight feed formerly employed. Right drive and control are retained. Model 37, the four-cylinder car, is also quite different from any of the Hudson company's last year models. It has a new type of motor, the chassis is of radically different design, the self-starting system is different, the location of the gasoline tank is in the rear, and, in fact, an entirely new appearance is made by this car. The motor has four cylinders cast in one block. The bore is 4.125 inches and the stroke 5.25 inches, developing 37 horsepowers at 1,500 revolutions per minute. Interchangeable valves of solid nickel steel operated by conically wound springs are features of the mechanism. The valves are housed in by two large cover plates, which are readily removable. The timing gears are kept to a helical pitch and run in oil. Zenith carbureter is used on this model as in the six, while the gasoline is fed under a 2-lb. pressure furnished by a plunger pump driven off the camshaft. The starting system is the Delco, including the motor-generator and 80-ampere-hour storage battery. The clutch on this car is a multiple disk. The gearset is a three-speed selected type, and is similar in every respect to that used on the 33. A feature of the springs is their length and also the use of a large number of thin leaves which are tongued and grooved to prevent side motion. In addition to this, leaf retainers are used.

Hupmobile—New Six Passenger

With the addition of a six-passenger car on the 32 chassis the Hupmobile line remains the same as the past year. The springs have been made larger and wheelbase has been increased on the 32, the latter now being 126 inches for the six-passenger car. The 32 touring car and roadster and the 20 roadster are continued. A new body model to be first seen at the shows is a coupé design.

Inter-State—A New Six

A new six-cylinder 45-horsepower motor will lead the Inter-State line for 1913. The motor is of the L-head type with the cylinders cast en bloc. The valves are all inclosed with an aluminum cover. The clutch and gearset being mounted rigidly to the rear end of the crankcase give a unit construction. An important feature of the equipment is the Alpco system for starting and lighting. The gasoline feed is by pressure.

Imperial—New Bloc Six

Five models of Imperial cars are offered for this season, built on four chassis. Most important is model 54, the new 4 by 5.5 en bloc six. It is fitted with electric starter and lights and has a 137-inch wheelbase. The other models are fours. The first of these, model 44, furnished in a touring car type, is very similar to model 44 of 1912, except that the cylinder sizes have been enlarged from 4.5 by 5.25 to 4.75 by 5.25 inches and the car is now equipped with an electric starting and lighting system. It has, furthermore, been lengthened in wheelbase by 2 inches, being now 122 inches. Model 34 differs in the extension of the wheelbase from 116 to 118 inches, and the motor size has been enlarged from 4.3125 by 5.25 to 4.5 by 5.25, and will also be provided with an electric lighting and starting system. Models 32 and 33, touring car and roadster, respectively, on the same chassis, will have a floating axle instead of the former semi-floating type, a motor 4.125 by 5.5 inches instead of 4 by 4.125 and tires 34 by 4 instead of 34 by 3.5 inches. The body types have been greatly improved, especially in the larger models, all bodies used in 1913 being of new design.

Jackson—Makes Big Six

The Jackson company also has its new six for the 1913 season. It is named the Sultanic, and incorporates a 55-horsepower motor and has a wheelbase of 138 inches. The model Majestic, equipped with electric starting and lighting system has a V-shaped radiator of the Metallurgique type. This car has 124-inch wheelbase and 36-inch wheels. All models have 15 gallon gasoline tanks in the rear, from which the gasoline is fed under pressure to a 7.5-gallon supply tank which is located under the shroud. The advantages claimed for this system are that if the air line to the storage tank should get out of order it would be possible to feed from the supply tank direct, the supply tank being located a foot or more above the carbureter and close to it, insures a steady flow of gasoline. All models have 10-inch upholstery, flush-sided bodies and are equipped with Firestone universal, quick-detachable, demountable rims except the Sultanic which has demountable wheels. The Olympic, a 35-horsepower model is equipped with a Disco starter.

Keeton—Follows French Design

Under foreign license, the Keeton, one of the two cars that are outgrowths of the former Croxton-Keeton Company, appear in two models, following French practices in design very closely. The two chassis are very similar in characteristic features of design, differing in size and number of cylinders. The Keeton six features a dynamo electric lighting system, optional wood or wire wheels and a wheelbase of 131 inches. The cylinders of this model are cast in pairs, 3.75 by 5.25, with inclosed valves arranged on the left side. The crankshaft is supporting on three bearings and ignition is fixed. The clutch is of the multiple-disk type, and the gearset, carried amidships, provides three speeds, selectively controlled by a single central lever. Internal expanding brakes on separate drums are provided, each set controlled by pedals, the clutch and service brakes being operated by the same pedal. On the four, cylinders are cast en bloc with manifolds integral, and a bore and stroke of 3.74 by 5.25. Gas starters are employed on both models. Left-hand drive is employed on both chassis, while five-passenger, two-passenger and coupé bodies are provided for each.

King—Makes New Four

In addition to its present four-cylinder type the King Motor Car Company will place upon the market another four-cylinder model, the features of which are somewhat of a departure from those incorporated in the model 36. The cantilever spring of the King, which has always been a distinctive feature, is absent in the new car, which has three-quarter elliptic rear springs and semi-elliptic front. The 36 makes use of half-elliptic rear springs which are mounted with the reverse side up as compared with the conventional construction. Drive through torque tube appears on the new creation as well as on its older running mate. This motor has an L-head design and is monobloc cast. The new motor will have greater power than the model 36. Its dimensions and the type of design to be followed were not yet decided upon at the time of going to press.

KisselKar—Longer Wheelbase

1913 KisselKars are characterized by greater wheelbase, which this year measures 121 inches as compared to 118 inches on the Four-40 of last year; 132 inches as compared to 124 on the Four-50 and 140 inches as compared to 132 on the Six-60. Some other important changes are the addition of a four-speed gearset on the 40-horsepower chassis, and of electric starting and lighting throughout the line, adjustable pedals, steering column carbureter adjustment and rear tire carriers. The Four-40 and Six-60 have the same bore and stroke, the motor dimensions being 4.5 by 5.25 inches. The Four-30 is a square motor with a bore and stroke of 4.25 inches. The Four-50 has a bore of 4.718 inches and a stroke of 5 inches. All cars are equipped with demountable rims and Timken bearings throughout except in the case of the gearset. Mea magnetos are used and 14 by 5-inch brake drums form a part of the control system. Right drive and control are used on all models. All models use silent-chain driven camshafts.

Krit—Better Equipment

Better equipment is the keynote of the change in the Krit cars for 1913. The trimmings are now nickel instead of brass, an

acetylene tank is furnished instead of a generator and a cowl dash is used on the touring car. One change in the 3.75 x 4-inch motor which is of importance in the silencing of the action is the addition of cover plates over the valve stems and tappets. The wheelbase on this chassis remains 106 inches.

Knox—Adds New Six

Four models of Knox cars are now on the market for 1913. A new six-cylinder car which comes under classification of Little Sixes is the feature of the line. The Knox big six, known as model 66, is also continued along with two four-cylinder cars known as models 44 and 45. The two latter are of identical specifications except for the wheelbases. The model 46, or little six, is the only entirely new model added to the line, and while the other three are put out under the 1913 date only minor changes have been found necessary. About the most noticeable features of the new car are the V-shaped radiator which was adopted after the success attained with this type in racing competition, the cover over the overhead valves and the provisions for silence throughout the car. The changes made in the models which have been continued to this year have been principally on the line of body refinement except for one important change in the four-cylinder motor, that is, the increase of the stroke by .75 inch. The stroke of this motor was formerly shorter than the bore, the dimensions being 5 by 4.75 inches, a stroke-bore ratio of .863. The new ratio is 1.1. The other refinements incorporated in the 1913 models include a three instead of a two-blade fan, oil gauge on dash and clock-speedometer arranged on cowl board for easy reference slides over pedal slots. Perkins acetylene starting and lighting outfit, windshield base moved to top of cowl instead of at beginning of cowl, choice of horizontal or vertical tire carrier, changed body lines and concealed door latches. Departures from former usage in this cylinders are cast in pairs instead of singly, as has been former Knox practice. Other departures from former usage in this model are the placing of the intake and exhaust valve on opposite sides of the head, the use of bolted-on in place of clamped-on manifolds, 45-degree conical valves in place of flat-seated valves, springs inside the push-rod guide to hold the roller on the cam for the sake of silence, rounder cam contours, chain drive on the camshaft and magneto shaft. Silence has been made a special feature of the design throughout. To further this object springs are used to take up rattle in all linkage throughout the car, this includes brake connections, torsion lever connections, valve push rods, steering lever, mud-pan hangers, etc. Aluminum covers are fitted over the valve action. Lubricating system on the Knox car is absolutely non-splash. It is what is known as the De-Dion circulating system, the oil being independently delivered to all bearings throughout the motor. Among the equipment features are a full electric lighting system and a motor-driven tire pump. Electric starting is optional at extra price. Jiffy curtains are fitted this year.

Lambert—Retains Friction Drive

Lambert model 99, which has been put on the market for 1913, incorporates the latest 40-horsepower Rutenber motor. The bore of this motor is 4.125 inches and the stroke, 5.25 inches. It is of the L-head type with the cylinders cast singly. This motor has the three-point suspension feature, Remy type R. D. ignition with the spark coil for the dual feature located underneath the hood. Two-inch valves for both the inlet and exhaust sides give interchangeability. The drive is taken through a cone clutch while the speed control is governed by the Lambert patented friction drive consisting of a composition disk operating against a specially surfaced wheel. The jackshaft is suspended on Gimbel bearings and the final drive is by Renolds silent chain, 2 inches in width and enclosed within a pressed housing. Full-elliptic rear springs and semi-elliptic front are used. The gear ratio on high is 3 to 1. The weight of the finished vehicle is 2,500 pounds. Beside this model two Buckeye models known as models 10 and 40 are made. These are similar to the larger model, but smaller. The bore and stroke of the model 99 is 4.25 by 5.25 inches, giving a stroke-bore ratio of 1.62. The stroke-bore ratio of model 99 is 1.23.

Lenox—Puts Out Six

A new six with a bore of 4 inches and a stroke of 5 inches will lead the Lenox line for the 1913 season. This new car is different from the old four-cylinder L-head motor in that it is of T-construction. The six-cylinder motor in tests at the Lenox factory developed 61.5 horsepower on the block. It is fitted to a chassis with 130-inch wheelbase, and has a three-speed gearset. Among the features of the design are a large leather-faced cone clutch and a double-jet carbureter. The Gray & Davis starting and lighting system is part of the electric equipment. The latter consists of a motor, generator and a 6-volt 90-ampere-hour storage battery. The starting motor has been added to the regular Gray & Davis lighting equipment, which remains otherwise the same in the new system. A cast aluminum cowl is fitted on all styles of body.

Little—Introduces Six

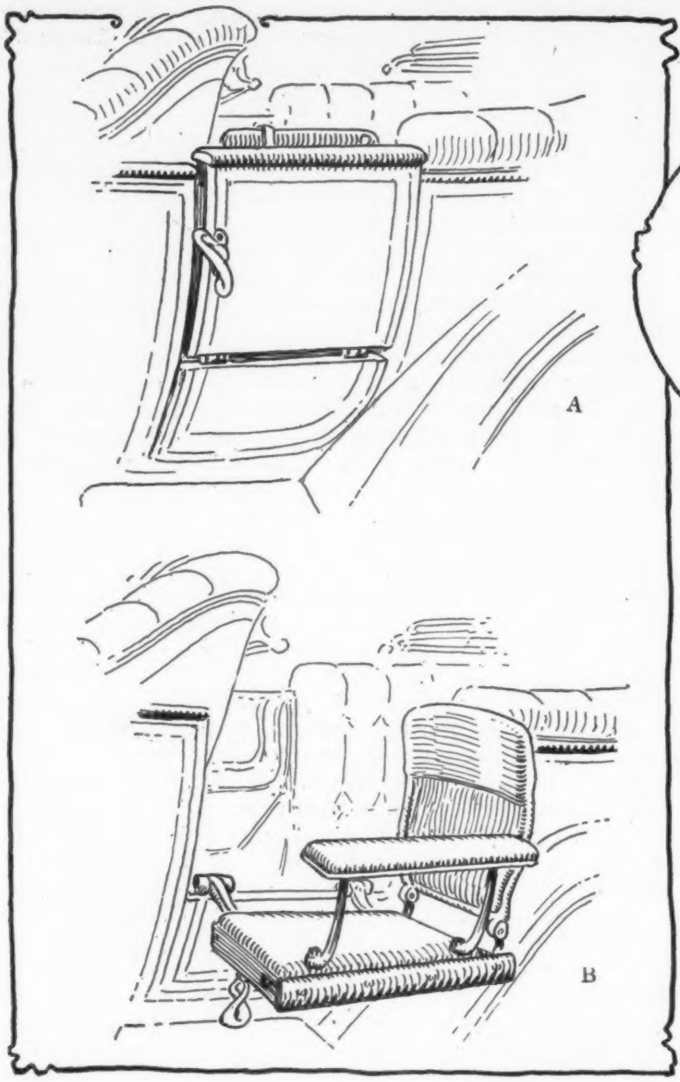
The most prominent feature of the Little line is the new six-cylinder car which has a wheelbase of 106 inches. The motor is of two block castings containing three cylinders each which measure 3 5-16 by 4 1-4 inches. It is of the L-head type. The valves are 1.375 inches in diameter. The motor is suspended at three points. Convex pistons; drop-forged crankshaft and camshaft with babbitt bearings; vacuum oil system; similar carbureter to that used in the Chevrolet; thermo-siphon circulatory system augmented by belt-driven fan are some of the structural details. The front axle is an I-beam section and the rear axle is semi-floating of special design. Brake drums, 12 inches in diameter, are used on the rear hubs. The wheels are 32 by 4 inches and the spring equipment the same as in the Chevrolet. The gasoline tank has a capacity of 18 gallons. Electric lighting is provided for by generator.

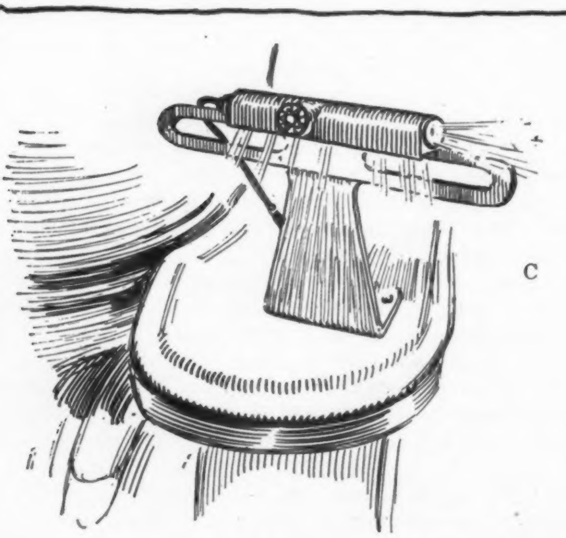
Locomobile—Adds a Six

Three models of Locomobile are now on the market for 1913. The newest of these is a little Six, rated at 38 horsepower. The big Six rated at 48 horsepower and the Four rated at 30 are continued. The principal changes to be noted are in the motor dimensions on the larger six-cylinder car. The stroke has been increased to 5.5 inches, necessitating changes in the connecting rods and cylinder lengths. An increase in horsepower has been affected by this change of motor dimensions, 82 horsepower having been developed at 1,800 revolutions per minute. Other changes which may be remarked are the increased valve sizes, changes in form, of the inlet and exhaust passages, and a new design of Locomobile carbureter. The latter differs from the former Locomobile product by its longer throat and the use of both hot air and hot water jackets. A larger magneto takes the place of the former type, while refinements in the oiling system of the 1913 cars consists of the shift of the oil pump drive from the exhaust to the inlet side of the motor. The oil-level pet-cock has been placed on the left side of the reservoir in the motor base, and a new type of oil lead has been designed to give an increase flow to the main bearings. Tires are now carried at the rear on brackets which are a unit with the frame of the car, and the running boards have been left clear to give a clean appearance. A motor tire pump forms part of the 1913 equipment. Electric starting and lighting systems are fitted to all models.

Lozier—Introduces Six

The Lozier light six, which has been introduced this season, is radically different in many respects from the other models produced by this company. Besides having a unit power plant and a motor in which the stroke-bore ratio is 1.52, the chassis involves other features which are new to Lozier practice. The wheelbase is 127.5 inches as compared with 130 inches on the other Lozier model. The cylinders are of the L-head type cast





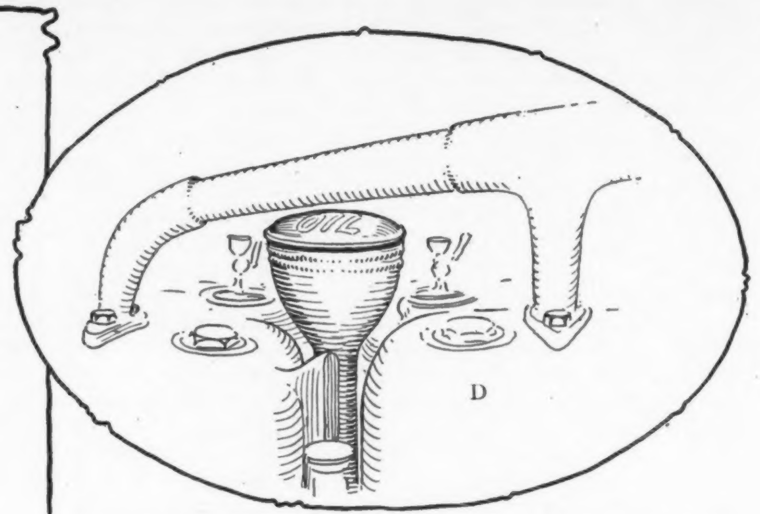


Fig. 12—A, Showing the Lozier door just lifted from its seating before it is swung to a horizontal plane to take the position of an extra seat

B, Showing seat of Lozier car in position after door has been folded down and arm rail lifted up

C, Rigid license plate holder which is furnished as part of the equipment of the Knox car of this year. It is riveted solidly to the mudguard, and is illuminated by electric light

D, Accessible oil filler hole between the cylinders of the Kissel-Kar

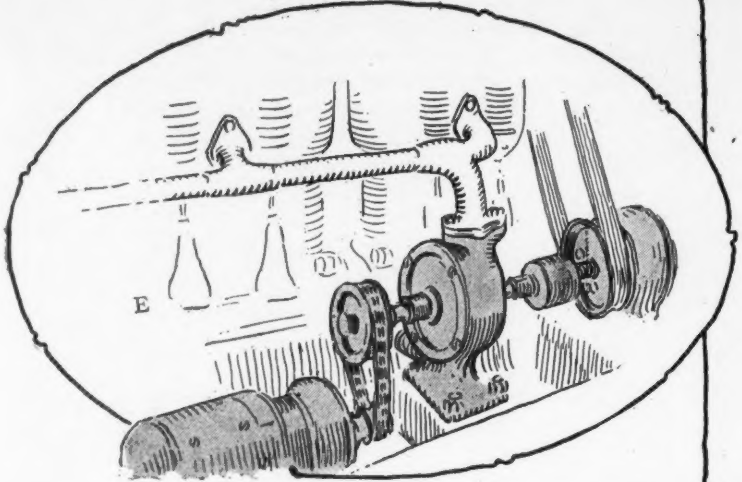
in blocks of three, while the large Lozier motor has T-head cylinders cast in pairs. A new design of intake manifold furnishing a separate connection to each cylinder is incorporated as are cover plates over the valve springs, cast-iron headed valves welded to carbon steel stems, rocker-arm valve lifters, plain bearing crankshafts, spiral timing gears, Bosch dual ignition, pressure gasoline feed, Gray & Davis starting and lighting, multiple-disk clutch with cork inserts on alternate disks, two sets of expanding brakes, and stream line bodies are incorporated. Of special note is the crankcase, the upper part of which is a large rectangle to which the cylinders are bolted and which extends out to the side frame members. This gives a shelf upon which the magneto and the lighting generator may be mounted. The larger Lozier, model 72, will be continued without change.

Marathon—Makes Bigger Motor

Three models of Marathon, designated Runner, Winner and Champion are on the market for 1913. Aside from the new names little difference will be discovered between these models and those which were upon the market last season, with the exception of an increased bore and stroke and the Runner, which was formerly known as the K-20. In all models, however, the axle shafts are incased in a one-piece steel housing, although the floating construction is only used in the two larger chassis, the smaller chassis having a semi-floating axle. The wheelbases have been lengthened in the Runner and Champion models. In the former from 96 to 104 and in the latter from 120 to 123. The Winner has a 116-inch wheelbase, same as in the model L-30 of the previous season. The tires are of the same size except in the case of the smallest model, where they have been increased from 32 by 3 inches to 32 by 4 inches. The springs have been lengthened in all three models to increase easy riding and give more comfort. Other changes in this respect have been the widening of the body and a greater length to give more leg room. In the two larger models the valves are inclosed by aluminum plates, one plate for each pair of cylinders, the castings being made in pairs. Roadster, touring and coupé bodies are furnished on the Runner and Winner, while roadster and touring bodies alone are fitted to the Champion.

Marmon—Uses Left Drive

A Marmon six and four are now on the market for 1913. The six is rated at 48-80 horsepower, and the four at 32-40. The bore of both models is 4.5 inches, and the stroke of the six is 6 inches, while the four-cylinder model has a stroke of 5 inches. Some of the features of construction on both models are force feed oiling through a hollow crankshaft, floating axles, two spark ignition, left steering and center control, cast aluminum bodies with sheet metal seat backs, electric starting and lighting, power tire pumps and combination clock speedometers. Marked differences in designs between the two models are only



seen in the clutch and in the wheelbase. In the four-cylinder model a cone clutch is used and in the six-cylinder model a dry plate multiple disk is fitted. The wheelbase on the four-cylinder model is 120 inches and on the six-cylinder model 145. A castor axle is now on the six.

Marion—Better Spring Material

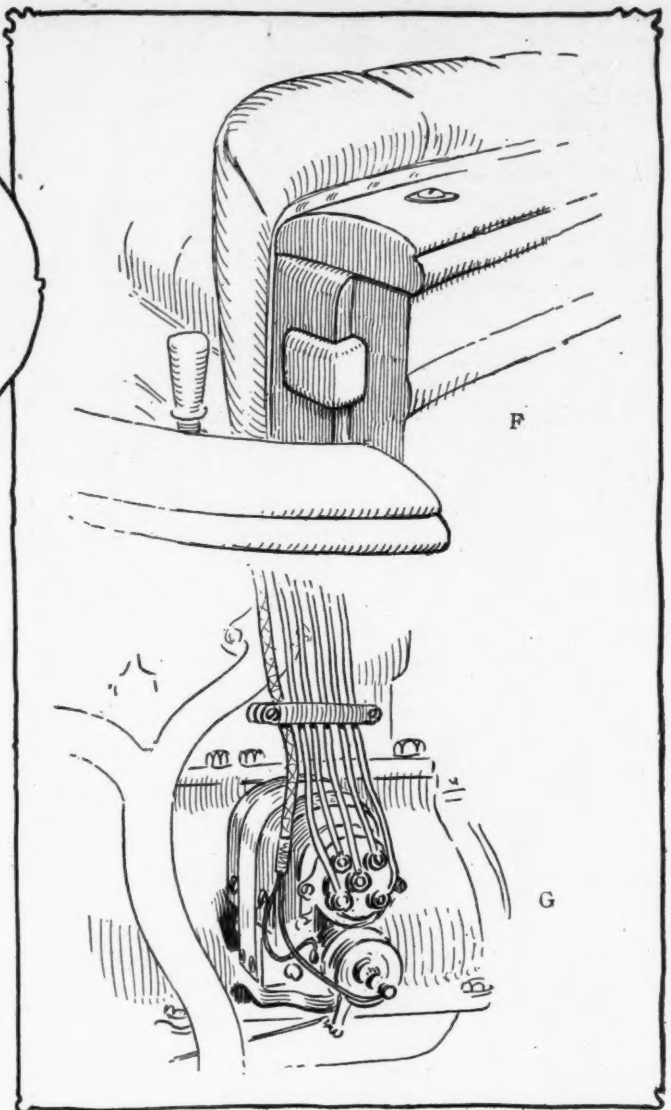
Marion cars for 1913 consist of four models, two touring cars and two roadsters, and the only mechanical changes announced are small alterations and refinement. English steel in the springs increases resiliency; the throw of the brakes has been increased to give more effect to the retarding forces, and the steering wheel is of the grip type. The cars have been lowered about 1¾ inches; tool boxes are concealed between the running board and the frame, acting also as a dust shield. Decided refinements in body lines have been made, making use of straight flush sides and attractive curves. Cars are completely equipped. The models 36A, 37A and 38A have an acetylene self-starter and the model 48A a Westinghouse electric starter. The motors of the three 30-40-horsepower models are 4 x 5 inches in bore and stroke; the 48A, 4.125 x 5.5. The wheelbases are 112 inches and 120 inches respectively. Upholstery, fittings and small details have received careful attention and have been materially refined, but the mechanical changes over previous models are few.

Mason—Encloses Valves

Two chassis, one with a two-cylinder horizontal opposed motor and the other with a four-cylinder vertical characterize the Mason line for 1913. The double motor has a bore of 5 inches and a stroke of 5 inches. It is chain driven through a planetary gearset, with two forward and one reverse speed. The four-cylinder model has a bore of 4 inches and a stroke of 4.5 inches. The cylinders are cast en bloc with the valves all on the right side. The valve parts are inclosed. A multiple disk clutch, three-speed gearset and shaft drive are used. Both models are fully equipped.

Matheson—Only Sixes

The single-chassis creed has been adopted by the builders of the Matheson. The four-cylinder chassis of last year has been abandoned, while the silent six is continued in a series with past productions and without radical modifications in design. This model is known as Series C, being the third series of the original design of this car. No change has been made on the overhead valve arrangement, the multiple-disk clutch or the rear-axle gearset that are Matheson essentials. The center control and two-spark, high-tension dual ignition were last year's features to which have been added an electric starter and lighting system of Westinghouse manufacture and a full set of shock-absorbers as regular equipment. The chassis is the con-



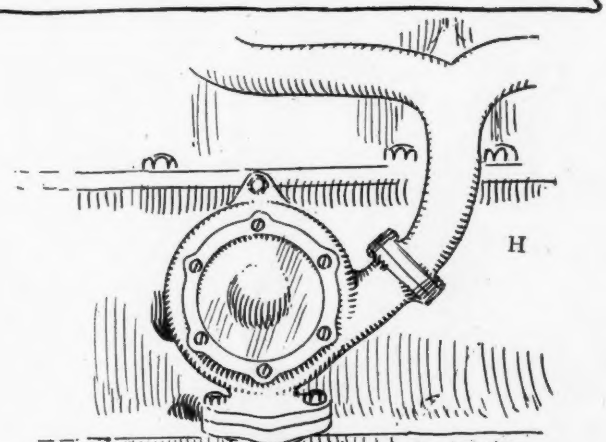


Fig. 13—E, Generator pump and fan drive arrangement on the side of the Lozier crankcase. Note fan casting fastened to crankcase arm

F, Rubber block inserted in door sill of Locomobile car to eliminate slamming noise

G, The magneto and water pump of the National car are driven by a horizontal shaft passing transversely through the crankcase. A bearing is provided on either side of the crankcase in the wall of the latter

H, This view shows the mounting of the water pump on the National car

tinuation of the larger of the two sizes made last year, having the same wheelbase of 135 inches. Features in the body details are two sole leather suitcases, side-lockers inside and running-board webs, a new tire carrier, and refinements in the center control quadrant, including a horn bulb in the assembly.

Maxwell—Adopts Left Drive

The Maxwell models for 1913 will number as follows: Three are on a 40-horsepower chassis, one a 30-horsepower, and the other a 22-horsepower roadster. All these models are left drive and center control. The special, which won the Glidden in 1911, has been continued with modifications which will be noted. Instead of being known as the Special, this year's model is known as the 40. In addition to the 40 touring there is a 40 roadster which is an innovation for this season. It is of the touring roadster type, having ample facilities for carrying fuel and tires and is fitted with a waterproof luggage compartment in back of the seat. It can be reached by pulling forward a trap section in the upholstery on the seat back. The 22 roadster which is new this season and which replaces the two-cylinder Maxwell runabout which has been discontinued, is also a new model and is of the conventional small runabout type with the gasoline tank mounted in the rear. It incorporates left drive and center control; progressive gearset 93-inch wheelbase and 56-inch tread. The motor is of the T-head type with the cylinders cast in parts, and has a bore of 3.75 inches, and a stroke of 4 inches. The front axle is tubular and the rear axle semi-floating. The improvements in the model 40 outside of left drive, center control, selective gearset, self-starter, and 36-inch wheels are an increase in the wheelbase and clearance, two foredoors instead of one, spring suspension on underpan, frame lined with leather, and numerous motor improvements which may be noted as follows: Longer connecting-rods, lighter weight pistons with three rings instead of four, relief valves on the engine, larger scoops on the connecting-rod ends, copper inlet and exhaust pipe gaskets, new stuffingbox on the valve push rods, lower compression, new carbureter, new inlet manifold, fan bracket integral with the water discharge pipe, an increased water capacity, and a thermo-syphon cooling system. Throughout the chassis larger bearings have been fitted, notably in the clutch, gearset, steering connections and universal joints. In addition to having the steering wheel on the left and the gear lever in the center the changes which have been made in the control are an aluminum steering wheel, better shaped throttle and spark levers, a more accessible accelerator pedal and greatr breaking leverage. The body dimensions have been increased, the front seats lowered 1 inch and the rear 1.5 inches. In connection with the redesign and improved finish of the body several accessories were added. Among them are upholstery pockets in the tonneau, larger ventilators in the dash, improved hinges on the bonnet and a bulb horn concealed beneath the hood. Improvements in the Maxwell 30, which was last year's mascot, have been along the lines of better appearance. A front axle of dropped forged I-beam construction has been added, the frame lowered, the wheelbase lengthened, flatter spring used, and new design of fenders fitted. On all models the wiring is carried better this year than last.

McFarlan—Adopts Floating Axle

Although basic design in the McFarlan line has undergone little change, numerous minor refinements have been incorporated. Starting with the current season the McFarlan cars will not be made in yearly models, but will be designated in series. What has heretofore been known as the little six will be the series S; the big six will be series M and the new model which has just been added will be series T. The changes which have been incorporated in the line include the adoption of the floating rear axle on all models while heretofore the series M only was so equipped. The front axle has ben changed somewhat, also the steering connections now being behind and above the front axle, whereas formerly they were in front of the axle. All spring bushings are now bronze. The front springs are semi-elliptic, mounted under the frame and the rear springs are scroll elliptics with swivel seats. The most notable feature is an entirely new chassis incorporating a 4 by 6 block motor. Although the cylinder casting is a single unit, four main bearings are used on the crankshaft. The end bearings are 4.5 inches long, and the middle bearings 1.875 inches, the crankshaft is 2 inches in diameter. The motor is of the T-head type and has a fan in the flywheel as well as one directly behind the radiator. The valves are all enclosed giving the motor a compact and simple exterior appearance. With the exception of the motor, and a somewhat heavier clutch the series T chassis is identical with that of series S. The gearset is a unit with a rear axle, and the gasoline tank is mounted on the rear of the chassis giving a pressure feed of gasoline to the carbureter. A few minor changes have been made in the series S motor which are notably as follows: The valves are now enclosed; the motor is hung on three points instead of four; the water pump has been brought forward and the air pump for the starting system set behind it; the air pump is driven direct from the water pump shaft and not by offset gears and the dynamo takes the place vacated by the air pump being driven by silent chain. The series M, formerly the big six, remains unchanged, except for the addition of the electric lighting system, and the shifting of the tire carriers to the rear where all tires are carried in the 1913 models. The compressed air self-starting system, which was a feature of the McFarlan line last season has been continued. It is operated by a four-cylinder Kellogg pump storing air under 200 pounds pressure, and a single tank swung on the right frame member.

McIntyre—Only a Six

McIntyre cars now appear in a single six-cylinder chassis for 1913. This model is known as the 6-40 Limited and it sells at an unusually low price for a car of six cylinders. The motor is of the T-head type with the cylinders included in a single block. Cooling is by the thermo-syphon system, while ignition is dual battery and magneto. A gravity-fed Stromberg carbureter is used. A multiple-disk clutch and four-speed selective gearset is mounted in an extension of the crankcase in one unit, the only visible moving part of the power plant being the fan and road wheels. The rear axle is of the floating type. The wheelbase is 120 inches and the tires 35 by 4. Right-hand drive with center control by a single lever is used and starting is accomplished by an electric starting device. Equipment includes five demountable rims, mohair top and envelope, windshield, electric horn, speedometer, clock and dust cover for the car.

Mercer—Electric Starting

Although abandoning the annual model plan the Mercer company has brought out a new series incorporating four models known as G. H. J. and K. These are mounted on two chassis and are of the following types: Four-passenger touring, five-passenger touring raceabout and roadster. The changes which have been made over preceding series are as follows: The fitting of the Rushmore electric starting and lighting system, replacement of the Bosch D. R. 4 magneto by the Z. R. 4, the addition of a four-speed instead of a three-speed gearset on models J and K, and the substitution of direct drive on fourth speed instead of on third. In the fore-door bodies the control levers have been brought inside and on the model H the body has been widened somewhat. The fuel feed in all models is now controlled by a positively driven pump in place of the exhaust pressure formerly used. The horsepower ratings on model G and H, according to the S. A. E. formula are 32.4 and on Models J and K, 30.6. The wheelbase of the first two models is 118 inches and of the latter two, 108.

Metz—Adds Touring Car

The Metz 22 is continued without change for the 1913 season except that a four-passenger touring body will be fitted to the 22 chassis. The motor is a four-cylinder en bloc casting having a

bore of 3 3-4 inches and a stroke of 4 inches. It is cooled by the thermo-syphon system in conjunction with a vertical tube radiator. It has a three-bearing crankshaft, is oiled by splash, has friction drive, left steer and center control. The friction numbers have been improved so that when a renewal of the surface is necessary a two-piece ring doweled together to form a complete ring can be put in place quickly and easily.

Michigan—Adopts Left Drive

Three Michigan models are on the market för 1913. Prominent features of these models are left drive, center control, electric lighting and four-speed gearsets. The motor has four cylinders cast en bloc and is of the L-head type, the valve being located on the right side. Mushroom push-rods operate the valves. The steering post is adjustable, the rake being made to suit the taste of any driver by a simple adjustment. The clutch and brake pedals are also adjustable, thereby making the whole control system to suit the driver's convenience. Either electric or gas starter is furnished at the option of the purchaser.

Midland—Produces a Six

Complying with the popular clamor for medium-priced sixes, the Midland Motor Company has produced a six in addition to the four, which it is continuing from last season. The new six has a T-head motor, 4 by 5 inches with a 135.5-inch wheelbase, 36 by 4.5-inch tires on demountable rims, left-hand drive with control levers in the center, a floating rear axle and the Gray & Davis electric lighting and starting system. The four-cylinder model has cylinders 4.5 by 5.25 instead of 4.5 by 5 as last year's motors measured, and with a 122-inch wheelbase, instead of wheelbases of 115 and 118 as on the former three models. Left-hand drive and center control are also new features. The rear axle is floating and the tires are 35 by 4.5 inches fitted on demountable rims, as in the former models. The Gray & Davis electric system is fitted on this model also, and both models are sold with full equipment. The bodies have been altered to fit the new chassis dimensions and in such redesigning has been brought up to date, and their lines greatly refined and improved.

Mitchell—Underslung Springs

Three types of cars are included in the Mitchell line for 1913, all of which differ from last year's construction in that they have double-dropped frames, with rear springs 7-8 elliptic, underslung, equipped with left-hand steering, center control, and have "T"-head motors of longer stroke in place of the L-head engine used in 1912. The motors of the four and bix six models are cast in pairs. The size is 4.25 by 7 inches. The little six cylinders are also cast in pairs, but the displacement is smaller than the foregoing, cylinder measuring 4 by 6 inches. Lubrication is by combination of the circulating and splash systems operated in connection with a gear-driven rotary pump. The carbureter is the latest type Rayfield. Bosch duplex ignition is installed in all models. Cooling, transmission and axles are retained as in 1912, but the driving clutches in the hubs have been eliminated. The wheels are larger, the two smaller models taking tires 36 by 4 inches and the big six being equipped with tires 36 by 4.5 inches. Complete accessory equipment is included in the list prices. This embraces electric starter and lighting system as well as the usual liberal collection of sundries. The wheelbases of the three chassis types are respectively 120, 132 and 144 inches.

Moline—Increases Bore

Increased bore of the cylinders, a greater wheelbase and more drop to the frame are the leading features of the 1913 Moline cars as compared to those of the previous season. The increase in the bore of the cylinders decreases the stroke-bore ratio materially, and this car, which had the greatest ratio in the last season, now drops back among a large number of others possessing the same ratio. The bore of 4 inches and stroke of 6 inches gave a ratio of 1.5. The bore is now 4.125 inches and the stroke remains the same, reducing the ratio to 1.45. Briefly, the motors have four cylinders cast in pairs with the valves on the left side, thermo-syphon cooling, Bosch ignition, Ward Leonard lighting and starting dynamo, and force-feed and splash oiling system. The clutch is a leather cone with cork inserts and has a diameter of 16 inches. The three-speed gearset is carried on roller bearings. A change has been made in the gasoline system, two tanks instead of one being used. The first is located on the dash and has a capacity of 8 gallons. The other is under the seats and has a 12-gallon capacity. Right drive and control are maintained this year.

Moon—Brings Out a Six

Following the undoubted trend of the new season the Moon company has brought out its first six-cylinder model. Electric starting and lighting equipment will also be features for this season, as will the popular left steering and center control. Mechanical changes are few, even the six-cylinder car being nothing but a large edition of the smaller four-cylinder model, having the same bore of 4 inches and a stroke of 5.75 inches. Cylinders are cast in pairs and another pair has simply been added along with the necessary changes in making the six-cylinder model. The other four-cylinder model is rated at 48 horsepower and has a bore of 4.5 inches and a stroke of 5 inches. The latest Stromberg carbureter is used for this season on the Moon cars and for lighting the Wagner system has been employed. The clutch used on the Moon cars is of the multiple-disk type. The gearsets have three forward speeds and are housed within a solid aluminum non-resonant casing. Four-splined shafts are used in the gearset, while a copper-asbestos gasket placed between the cover and the box itself maintains an oil-tight condition.

Nance—Introduces a Six

The Touraine six, a new model turned out by the Nance Motor Company, a newcomer, is using a 4 by 5.5-inch motor, with the cylinders cast in blocks of three. The motors test to 61 horsepower at 2,220 revolutions per minute and are of the T-head type. The self-contained circulating system takes care of the lubrication, the oil supply being carried in the base. A multiple disk clutch with alternate disks faced with Raybestos transmits the power to a three-speed gearset. A straight line shaft drive is carried on crucible steel cross members. Axle is floating; brakes are located on rear wheels and act on 16.625 by .625-inch brake drums; stearing gear with worm and gear type and wheels are optional wood or wire. Wheelbase on the seven-passenger touring model is 134 inches. On the five-passenger Phaeton it is 124 inches and on the special roadster, 112 inches. A double jet carbureter which the makers claim delivers a mileage of 10 to 16 to the gallon of gasoline, is employed on all cars. The lighting is by the Gray and Davis electric dynamo system.

National—Electric Starting

The latest National "40" Series is known as the Improved Series V. Among the newest features of these cars, five of which are called regular models, are the Gray and Davis electric starter and lighting system. These models also include left-side drive; center control, long-stroke motor, 4.875 by 6 inches; tire pump integral part of the motor; Bosch dual double magneto; electric horn; Truffault-Hartford shock absorbers on rear; 128-inch wheelbase; adequate baggage-carrying compartment, concealed but easily accessible; adjustable ventilating and rain vision windshield; multiple jet carbureter; speedometer; tire carrier in rear; gasoline pressure feed tank with gauge in rear; plain, continuous inclosed metal guards; tool chest concealed by splasher and an extra Firestone demountable rim. The tire pump is capable of fully inflating a tire in 3 minutes.

Norwalk—Sixes Only

Six-cylinder cars will be specialized in the Norwalk 1913 line. These are made in two chassis known as Model A and Model B. The Model A underslung Six incorporates a T-head motor of

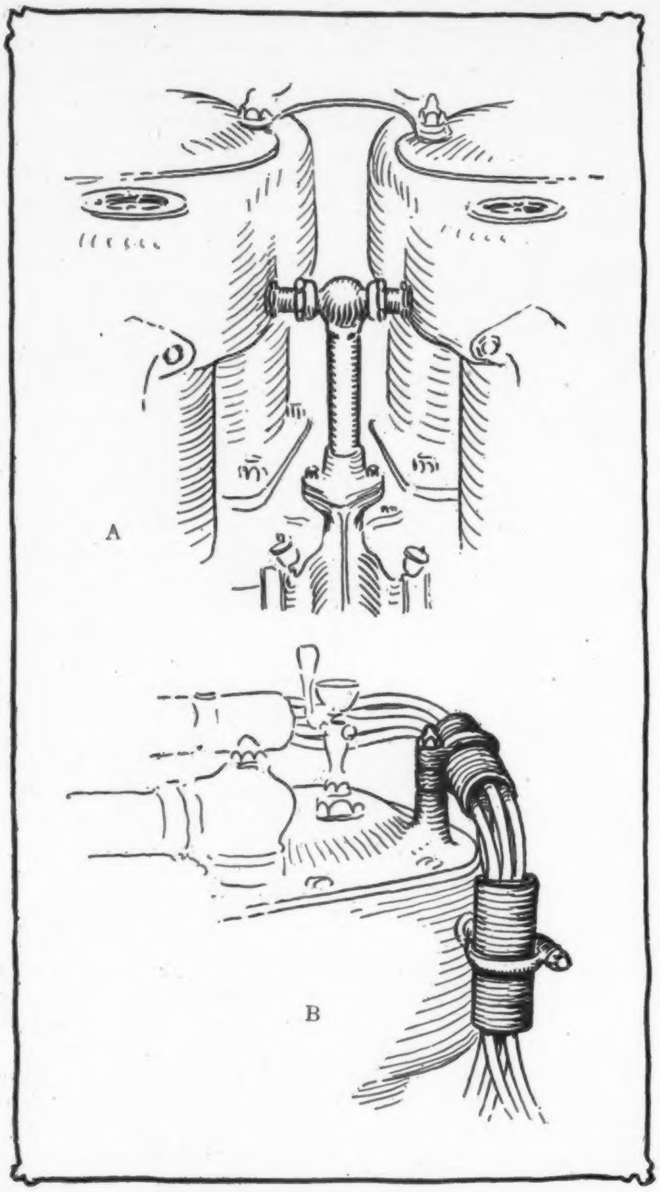


Fig. 14—A, Oldsmobile water intake manifold; B, National wire holder

4-inch bore and 5-inch stroke. The cylinders are cast three en bloc with integral water jackets. The valves are 2.125 inches in diameter and the valve action is covered by removable plates which are rendered rust-proof. A positively circulated splash system is used for lubrication. Among the fittings for the motor are the Carter double-jet six-cylinder carbureter, and the Gray and Davis electric starting device assembled integrally with the motor. The clutch is multiple disk having 30 saw-blade steel disks, each 8.125 inches in diameter and operated by 800-pound engaging spring. Three-point suspension of the motor gearset and clutch is used. Model B underslung Six has a motor of 4.25 inches bore and 5.5 inches stroke. It is also the T-head type and the cylinders cast in three. In general design it is similar to Model A, the valves being inclosed and the same oiling system. The electric starting and lighting system used in conjunction with this model is a unit with the flywheel instead of the Gray & Davis independent unit schemes employed on the other models.

Nyberg—Adds New Four

Four models of Nyberg car comprise the 1913 line. There were three last year, and these are continued under the name of the Four-40, Six-45 and Six-60. To these has been added the smallest car, which is known as the Four-37. The same general construction is employed throughout the four models, and they differ only in sizes of the various parts. On the three larger models two different wheelbases are employed, the small touring cars having 128-inch wheelbase and the large touring car 138 inches. All models have a unit power plant with three-point suspension, inclosed flywheel, disk clutch, rear spring bolted to rear cross-member and semi-elliptic front springs. The Four-37 model incorporated the new long-stroke Rutenber motor, having a bore of 3.75 inches and a stroke of 5.25 inches. Of chief interest in this motor is the fact that the magneto and water pump are located in the front instead of on the side and are driven by the same half-time gear that drives the camshaft. Another feature of this motor is that it is a monobloc casting. Every part of the motor is inclosed. The crankcase is of ribbed aluminum alloy. Ignition is supplied by Remy magneto and a Schebler or Stromberg carbureter forms a part of the equipment also. The two six-cylinder models are listed with full equipment, including electric starter, lights and horn, also top, windshield, speedometer and five demountable rims. Left-hand steering and center control are standard.

Oakland—Adds a Six

Another six to be introduced for the season of 1913 will be that manufactured by the Oakland Motor Car Company. The three four-cylinder types known as models 35, 40 and 42, comprise a group of four-cylinder models. The first of these has a 3.5 by 5-inch motor, while the other two are mounted on the same chassis equipped with a 4.125 by 4.75-inch motor. The cylinder dimensions on the latter are the same as those on the Six-60, which has just been introduced. Having one design in this way permits the concern to standardize a great many parts and thus cut down the cost of manufacture. The wheelbases of all four models are different, being 112, 114, 116 and 130 in the order named above. The difference in construction between the Six-60 and the Four-42 lies in the fact that the motor on the former has its magneto, water pump and camshaft driven by silent Coventry chain, whereas in the four-cylinder motor they are driven by gears. Models 35 and 40 differ from the other two in that their axles are semi-floating instead of floating; they have a single drop frame instead of a double drop; their radiators are flat and not curved or V-shaped; they carry 15-gallon gasoline tanks under the front seats, and feed the fuel by gravity in place of pressure as used on the other models, where the tanks are flung in the rear. A feature of the Oakland line for the coming season is the fact that the running board does not run the entire length of the car on the 42 or Six-60. It is broken in the center and forms two steps, one for the fore-door and the other for the rear. Deaco lighting and ignition will also be features of the 1913 car. Twelve different body types allow a wide range of selection.

Ohio—Makes a Six

Two fours and one six pleasure chassis are put out by the Ohio Company for the 1913 season. On these will be mounted all styles of body. The six and fours are made on the same general styles, the dimensions, however, being different. Six-cylinder car has a wheelbase of 138 inches and a motor of 4.5 x 6 inches. A seven-bearing crankshaft is used on this motor. Left steer and center control are also features. The equipment of the car is very complete, including electric light generator, electric lights, semaphore tail lights, storage battery, trouble finder, 37 x 4-inch demountable rims and customary tool equipment. Models 19, 20, 21, 22 and 23 are mounted on a four-cylinder chassis incorporating a motor rated at 47 horsepower of the four-cylinder type with T-head cylinders cast in pairs. The features of this model are the 2.125-inch valves, the helical timing gears, hot-water-jacketed carbureter and full equipment. The other four-cylinder chassis upon which are mounted models 13, 14, 15 and 16 also includes a unit power plant with three-point suspension. The motor has a 4.25-inch bore and a 4.75-inch stroke; 2.125-inch valves are also

used in this motor. The general design of the motor is the same as that mentioned in the four-cylinder motor above.

Oldsmobile—New Light Six

A new light six Oldsmobile has been introduced for 1913. It incorporates a 40 to 50-horsepower motor, electric starting and lighting, three-point suspension, vanadium steel floating axle, 135-inch wheelbase, unit power plant, and a 30-gallon gasoline tank mounted on rear, a one-piece adjustable glass front and full equipment including a motor-driven tire pump. In addition to this car the four-cylinder Defender will be the only other model to be made for the coming season. This has a 4 by 6 motor and is practically the same as for 1912. The bore of the New Six is 4.125 inches and the stroke 4.75 inches. The cylinders are cast in pairs and are given a gray enamel finish.

Only—Now Has Four Cylinders

The Only car which has attracted considerable attention owing to its novel features of design will be continued with practically no changes for the 1913 season. The original car was a single cylinder model but within the last year the motor has been changed to the four-cylinder type. The bore is 4.25 inches and the stroke 7.875 inches. The valves have a head diameter of 2.5 inches and are actuated by roller followers on the cam. The car is guaranteed to operate at 30 miles on one gallon of gasoline and is also guaranteed to attain a speed of 75 miles an hour. The carbureter is a special design having three auxiliary gas and air intakes, the throttle actuating air, gas and gasoline passages at once. Thermo-syphon cooling is used in conjunction with a special design of radiator. The center of gravity of the car is in the same horizontal plane as the wheel hubs. The wheelbase is 112 inches and the tread 56 inches.

Overland—Bigger Wheels

Two Overland models are on the market for 1913. They are known as models 69 and 71 and replace the 1912 models 59 and 61. Although still retaining the principal features of Overland construction, a number of changes have been made in both these models. Model 69, the cheaper of the two, is a four-cylinder L-head type with its cylinders cast separately. The bore is 4 inches and the stroke 4.5 inches. Thermo-syphon cooling, combined splash and force-feed oiling, Remy dual ignition and Schebler carbureter take care of the functioning of the motor. Some of the changes made in this model are oil-tight guides around the valve tappets, oil grooves in the pistons, flanged in place of threaded intake manifold, new type of rear axle which is called by the Overland company a three-quarter floating, brakes increased in diameter to 13 inches, modified brake equalizing device which involves the use of ball-and-socket joints in place of ordinary linkage, the wheelbase has been increased to 110 inches, 4 inches more than last year, making an extreme length for the touring car of 168 inches and for the roadster 151 inches. The design of the model 71 chassis is practically the same as model 69. The motor is larger, having a bore of 4.375 inches and a stroke of 4.5 inches. It is rated at 32.6 horsepower. The differences between this car and the model 69 are its larger motor, and a full set of electric lights throughout, the oiling is all by splash, the three-speed gearset is mounted on the rear axle in the same manner as in the model just described, the wheels are 34 by 4 inches in place of 32 by 3.5 inches as on the model 69, the axle is floating, tool boxes are fitted and on both models, with the exception of coupé types, Presto starters form part of the equipment.

Paige—Adopts Left Drive

The Paige 36 is a new feature of the line of this company for 1913. It involves left drive, electric starting and lighting, silent-chain drive for camshaft, pump and generator and en bloc motor, which is a unit power plant, and other features of a modern nature. The Paige 25, which was on the market last year, has been continued with no changes in construction, a little more expensive equipment being added. The 36, which is now the leader, has a bore of 4 inches and a stroke of 5 inches with the entire motor, clutch and gearset in one unit. The aluminum crankcase is continued back and includes the two other members of the plant. The Gray & Davis system of lighting and starting and Bosch magneto for ignition complete the electric equipment. Both gas and spark control are mounted on stationary quadrants above the steering wheel, while the dash regulator for the carbureter is also supplied. Gasoline feed is by gravity, the tank being installed beneath the shroud and the filler cap being located just forward of the windshield. Nothing is carried on the running board, the tires being mounted on solid brackets to the rear of the car. One auxiliary dash or cowl board carries all the dash equipment, making the switches convenient to the operator. The clutch is multiple-disk with cork inserts, the rear axle is of the floating type, five demountable rims are furnished with the car and license brackets are a part of the equipment.

Packard—A New Six

Of chief interest in the Packard line for 1913 is the little six car, which has just been introduced. It is known as model 38 and incorporates a number of features not to be found in any of the other Packard models. Chief among these are the adoption of the left drive; left control; Delco starting, lighting and ignition; steering column control board for lighting, starting, ignition, carbureter and electric horn. The motor differs from the larger Packard six in that it involves L-head cylinders cast in pairs. The larger six has a T-head motor with cylinders cast in pairs. On the new model the valves are all inclosed by removable cover plates. The valves are on the left side of the motor and the carbureter on the other in the model 38, giving rise to a new shape of manifold for the Packard. This runs between each two blocks of cylinders to the valve side of the motor. According to block tests the rated horsepower of 38, according to the S. A. E. formula, is attained at 800 revolutions

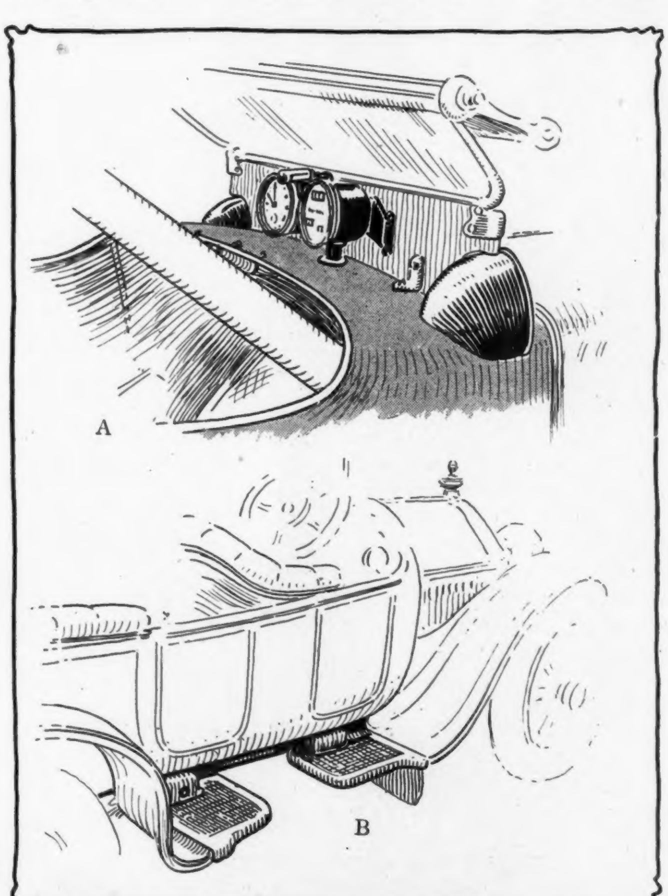


Fig. 15—A, National speedometer mounting above cowl; B, Oakland non-continuous side steps

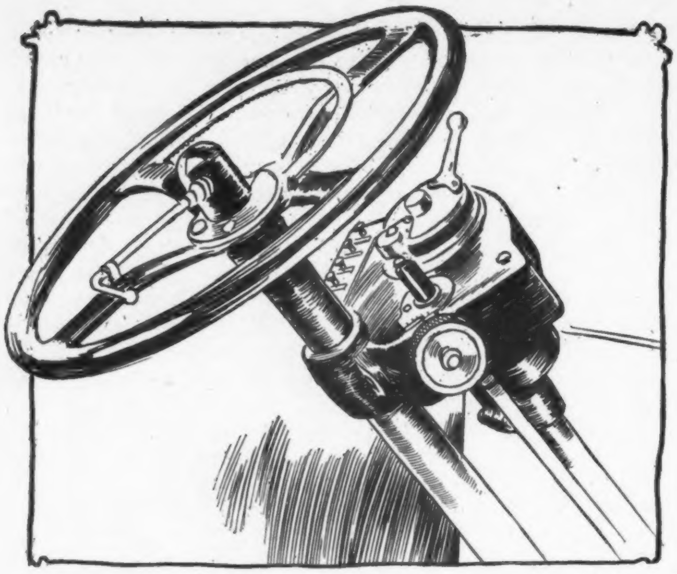


Fig. 16—Packard electric control board on steering post

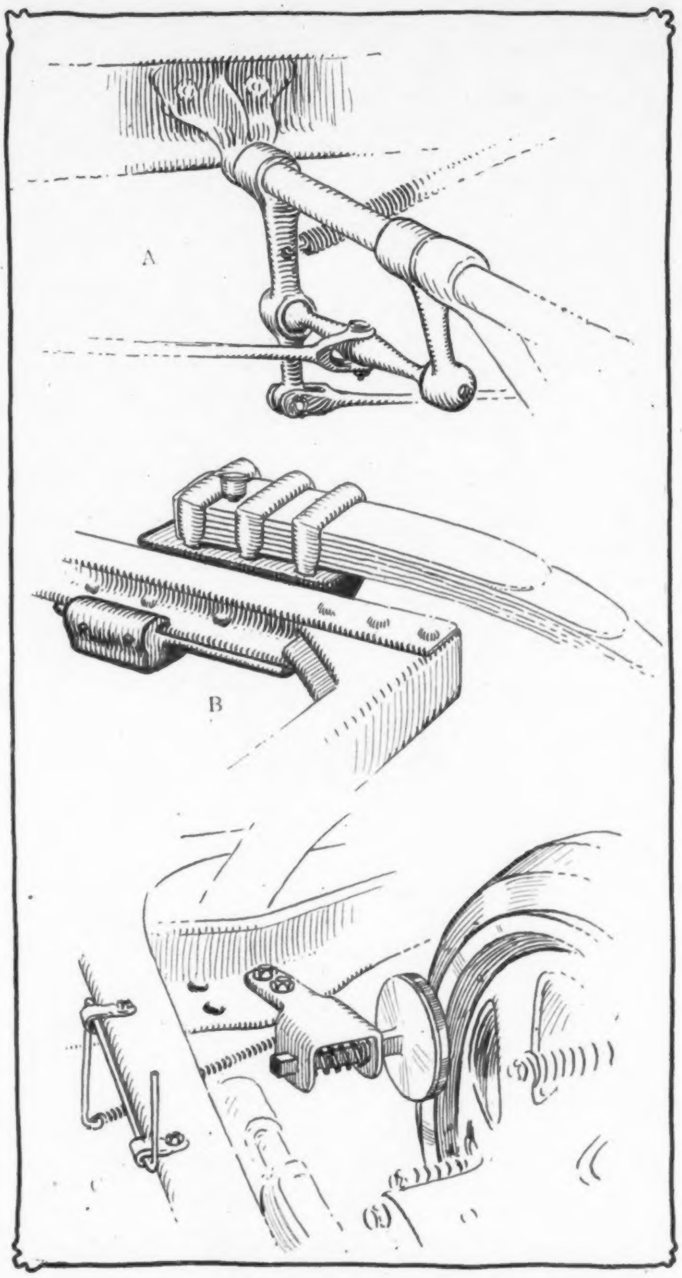


Fig. 17—A, Overland brake equalizer; B, Overland triple spring clips; C, Overland clutch brake

per minute. The bore of the little six is 4 inches and the stroke 5.5 inches. Other features of interest in this model are the use of exterior brake adjustments, grease cups, the gearset and differential which can be removed as a unit in case of desiring to make any repairs, an auxiliary oiling system which comes into play when the throttle has been opened a distance equal to that necessary to cause the car to go 30 miles an hour on level ground. This is interconnected with the throttle.

Palmer-Singer—A New Six

For 1913 the Palmer and Singer Manufacturing Company is putting on the market a six-cylinder, 60-horsepower model and a six-cylinder, 45-horsepower model. Both of these will be fitted with a two and five-passenger body at the purchaser's option. The Six-60 remains unchanged for 1913. The changes on the Six-40 or Brighton model are the fitting of 36-inch wheels in place of the 34-inch, the floating axle with radius rods connecting the frame and very slight body refinements. The big six has its cylinders cast in pairs and is of the T-head type. A four-speed gearset and multiple disk clutch are also features of this model. The Brighton six has its cylinders cast in triplets, is of the T-head type with 4 by 5-inch cylinders, and uses a three-speed gearset and a multiple disk clutch. The wheelbase on this model is 127 inches, and on the Brighton 138 inches. Electric lighting and air starting and tire pumping outfits are included in the equipment of both models.

Paterson—Unit Plant

Four models comprising two chassis constitute the 1913 line of the W. A. Paterson Company, Flint, Mich. On the smaller chassis are built models 43, 43-A and 41, identical except in equipment. On the larger chassis is built model 47. The chassis of model 43 has a motor of four cylinders, 4.13 by 4.75 inches, cast in pairs with valves on the left side. Their mechanisms are fully inclosed and the motor, flywheel, clutch and gearset are assembled as a unit. The clutch is of the cone type, and the gearset provides three speeds forward and one reverse. An electric lighting and starting device is installed and demountable rims. The rear axle is of the floating type, the wheelbase is 116 inches and the tires are 34 by 4 inches. Type 47 has a motor of 4.5 by 5.25 inches and a wheelbase of 122 inches, with 36 by 4-inch tires. The smaller models are all provided with five-passenger bodies, while the larger carries seven pasengers.

Pathfinder—Electric Starting

Instead of four models the Pathfinder line for 1913 consists of six, all mounted on one chassis. No radical changes have been made in the chassis except those that would be entailed by the installation of the Gray and Davis electric starting system. The motor is the latest Continental type of L-head design with cylinders cast en bloc. The bore is 4.125 inches, and the stroke 5.25. The motor develops 42 horsepower at 1,330 revolutions per minute. Lubrication is taken care of by two plunger pumps, one delivering a stream of oil to the gears, and the other to the main bearings in the crankcase. Thermo-syphon cooling is used; a cone clutch; three speed gearsets; irreversible steering and chariot type wheels.

Peerless—Refines Motor

Pioneers in 1913 announcements, the Peerless Company produces for the new year five models whose features differ from former productions only in refined detail, as yearly models are contrary to the manufacturing policy of this company. The Bosch double-dual ignition system tried out in the 1912 cars has been discarded in favor of the simple dual system for reasons in simplicity. The piston throttle valve formerly used has been abandoned in favor of the damper type. The Gray & Davis lighting generator is now driven from the fan shaft instead of

from the pump shaft, and operates at higher speed. A unique arrangement is provided to prevent loss of oil through leaving the oil drains in the crankcase open. This consists of a lever linkage which makes it impossible to close down the hood with the oil petcocks open. A small force pump on the dash is provided to prime the motor by drawing gasoline from the float-chamber and spraying it into the valve chambers. The models are designated 38, 48, 60, all sixes, and 24 and 40, fours. The Gray & Davis lighting and starting system is regular equipment on all models.

Pierce-Arrow—All Sixes

While the Pierce-Arrow line is continued with three six-cylinder models as has been the policy of the company for years since it dropped four-cylinder constructions, all three models have undergone a thorough housecleaning which places them

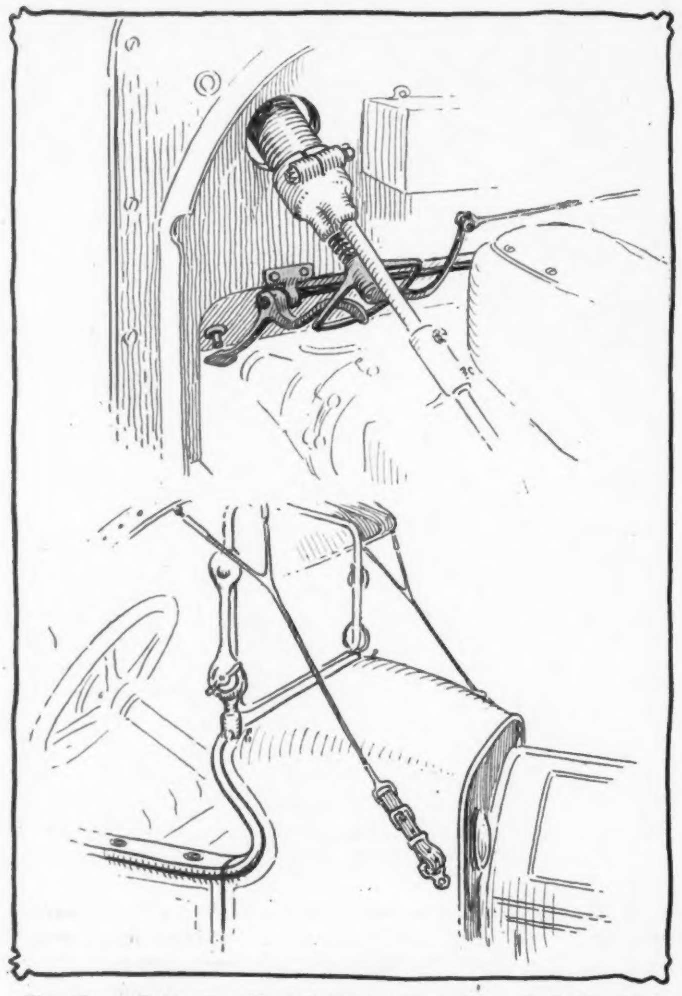


Fig. 18—A, Paige throttle and spark cam control; B, Oakland top strap attachment

much in advance of other makes in not a few engineering details. While generally classed as conservative this company has also been a pioneer, and when changes were deemed improvements, there never was any hesitation in making them, irrespective of other makers. This year shows much improvement and some pioneering. Only one model has a larger motor, namely the 36, which has been changed to 38, its stroke now being 5.5 inches instead of 5.125 inches. It has larger valves and more power, hence the increase in its rating. Now for the general improvements that agree in all models. Gravity motor oiling is superseded by direct pressure feed up to 20 pounds to seven crankshaft bearings and gears, and thence to cranks and wristpins. The old gravity oil tank above the cylinder is gone and the motor looks much cleaner. It is still a non-splash system. A compressed air starter is fitted. The 200 pounds air pressure is created by a four-cylinder pump mounted on the front end of the gearbox and driven from the gearset countershaft. It delivers to a reservoir on the chassis from which the motor draws. In addition to this there is the usual air piping and air distributer with dash control. The gasoline primer on the dash connected with a nozzle in the manifold to facilitate starting, is continued and now all models are fitted with compression releases. The carbureter has been overhauled. It is a two-jet design; the auxiliary nozzle located in the juncture of the auxiliary air passage with the mixing chamber does not come into operation until speeds of 800 or over are reached and the auxiliary air valve has opened. The two nozzles give better motor performances on low and high speeds. The needle valve in the main nozzle is improved by a protection, which prevents the tapered end of the valve being injured when screwed up to finer adjustments. Leather disk couplings now are used in the magneto and water-pump shafts. These are quiet. Leaving the motor there are several other improvements. The German bronze facing on the clutch cone has been dropped and leather substituted, it being lighter and thereby facilitating gear-shifting. Another clutch improvement is that the clutch rocker shaft is shorter than formerly and carried on two brackets from the motor rear support instead of the frame side members. Electric lights are standard, the motor carrying a Westinghouse generator.

Pilot—A New Six

In addition to the 40 there is a Pilot 50 on the market for this year and also following the general trend a six-cylinder, 60-horsepower model. All three models have T-head, Teetor motors. Both four-cylinder models have a bore of 4 1-2 inches, the strokes being 5 inches for the model 40, and 6 inches for the model 50. The Six-60 has a bore of 4 inches and a stroke of 6 inches. All three models are fitted with floating axles, Brown-Lipe differentials, semi-elliptic, front and rear springs, cone clutches. Electric starting and lighting is also a feature with the Pilot line this season.

Pope-Hartford—New Four

Electric lighting and starting and one new model have been added to the Pope-Hartford line for 1913, making a total of three models on the market for 1913. They are known as the 31, 33, and 29, and are rated at 40, 50 and 60 horsepower respectively. The new model 31, rated at 40 horsepower, is made in five body styles, a touring car, phaeton, roadster, limousine and coupé. It embodies a four-cylinder motor cast in pairs having a

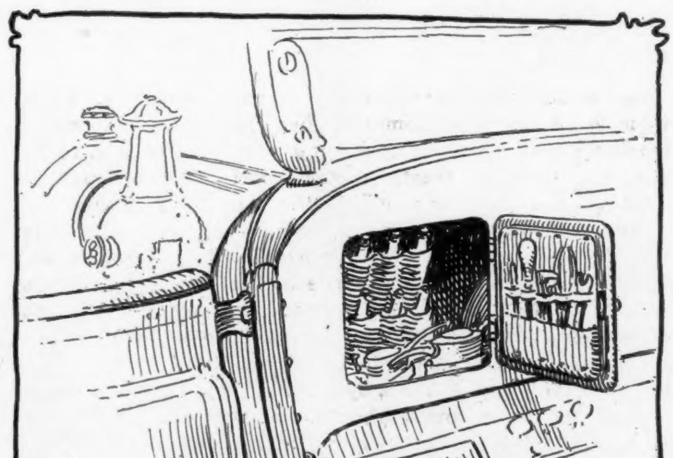


Fig. 19—Pierce tool boxes mounted in dash on either side

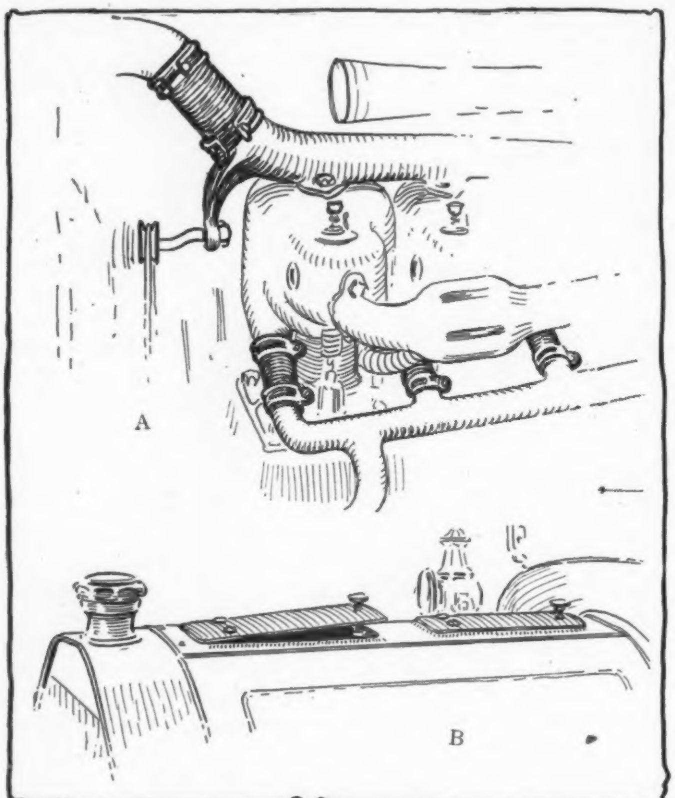
bore of 4.3125 inches, and a stroke of 5.125 inches. The Pope-Hartford carbureter which has been used in connection with Pope models in the past is fitted to this new model. A planetic radiator of distinct Pope-Hartford design is a feature of the cooling system while the ignition is taken care of by Bosch dual system. A leather-faced cone clutch with cork inserts transmits the power to a four-speed gearset having its direct drive on fourth and composed of chrome nickel steel gears, and shafts mounted on Timken roller bearings. The worm-and-gear steering is used and another feature of the control is the double brakes acting on drums of 15.5 inches diameter with 2.5-inch faces located on the rear wheel. Thirty-six by four and one-half wheels running on Timken roller bearings are used all around and are fitted with Firestone demountable rims. A metal body with mahogany dash hooded and provided with a panel in front of the forward seat is used on this car. The tool box is connected rigidly to the body of the car at the rear and is composed of pressed steel. The gasoline tank is removable and can be removed without removing the body, and has a capacity of 18 gallons. Gray and Davis starting has been fitted to this model. The big four-cylinder model rated at 50 horsepower, having a bore of 4.75 inches and a stroke of 5.5 inches, has been continued and numerous improvements and refinements incorporated. Among these are the addition of the Gray & Davis electric lighting and starting systems, a more complete equipment including adjustable windshield, cape top and curtains, trunk rack, demountable rims, etc. The Pope-Hartford model 29 six-cylinder rated at 60 horsepower is similarly equipped and is now in its third year. Among the features of the six-cylinder model are the double drop frame, its four-speed roller bearing transmission, full floating roller bearing rear axle.

Premier—Only Makes Sixes

Starting with this year the Premier company has abandoned the manufacture of four-cylinder models and has concentrated its attention on two sizes. The big six car is practically the same as that marketed as the model M six of 1912. It has the 4.5 by 5.25-inch motor cast in pairs. The little six is a new model but differs only in the size of its motor and in chassis dimensions from the big six. In the latter the only change of importance from the 1912 style construction is the use of a universal joint in place of the ball joint formerly used in the steering-rod connection. In general, it may be said that Premier construction embodies a T-head motor with a movable disk clutch as a unit working through a three-speed sliding gearset to bevel-gear rear axle. The motor of the little six, with a bore of 4 inches and a stroke of 5 inches, has its cylinders, unlike the big six, cast in threes. As is customary with Premier practice, the upper water-jacket is a light, removable aluminum plate. The valves are inclosed by aluminum side plates, which are readily removable, and are operated by push-rods having rollers 1 inch in diameter. The cooling system is so arranged that should the pump become disabled a natural thermo-syphon action would be set up and the danger minimized. Left drive and center control are features of the 1913 Premier, as are also the spare tire carrier on the rear and the gasoline filler pipe between the two front seats, which may be reached by lifting the seat arm.

Pullman—Drops One Model

Instead of four models the Pullman company has placed three on the market for the coming season. The models made this year are known as the 4-36, 4-44 and 6-66. The first number in each case refers to the number of cylinders, while the second refers to the rated horsepower. Last year the models were known as the 4-30, 4-40, 4-50 and 6-60. The 4-50 has been dropped and the other three continued with modifications. The principle changes lie along the lines of improvement in manufacture, the selection of better material and working to closer limits. For all three models the following changes will be noted: Larger radiators, lighter wristpins, dash carbureter primer, larger steering wheel and longer springs, both front and rear. Besides



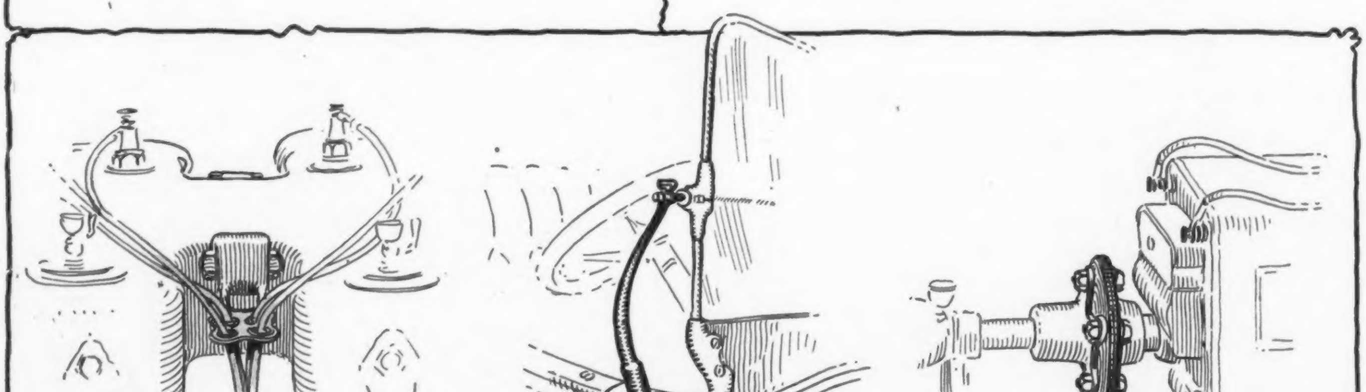


Fig. 20—A, Maxwell rubber water manifold connections; B, Pierce hood cover plates; C, Pullman wire clip; D, Peerless windshield bracket; E, Pierce leather-disk magneto drive coupling

these there are changes which have only been made on the 4-44 and 6-66. These include a new and stiffer crankcase bottom pan, an extra bearing on the camshaft, a dash oil control, a flywheel 2 inches larger in diameter, and extra bearing of the shifter dog of the gearset, an electric lighting generator and, on the 6-66 only, embossed yokes on the rear wheels. Careful manufacture throughout the entire chassis is shown by the use of nickel-steel bolts, the cam contours are the same for all models and grinding work in this field is standardized. Bosch dual ignition is used on all models. An Ever-Ready starter is fitted to the larger models, while a feature of the equipment is an electric vulcanizer.

Rambler—Electric Starting

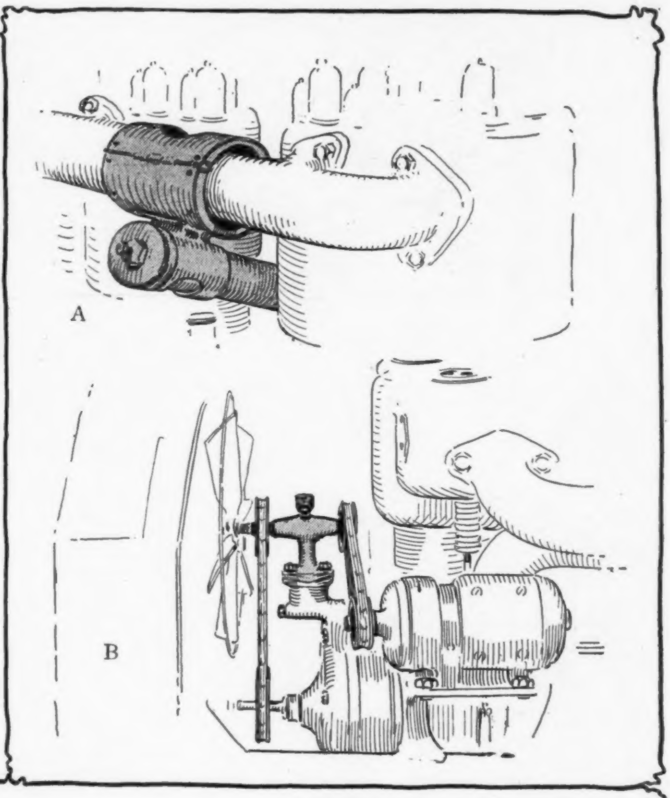
A new Rambler model is now on the market for 1913; it incorporates what the makers call a gasoline-electric motor. The starting system being combined with the flywheel end of the motor in such a way as to be a unit with it. Other changes in the Rambler line, which are all made on the single chassis embodying the 4.5 by 5-inch motor, include the adoption of the cone clutch, a modification of the gearset giving a 1-inch shorter gear shift, adjustable steering column upon which the angle of rake may be altered, and, in the motor, larger valves, a Stromberg carbureter, longer connecting-rods and a better placing of the wiring. The offset construction of the cylinders has been continued as in the past. A new oiling system composed of the Detroit mechanical oiler of 2 gallons capacity mounted on the side of the motor and its corresponding leads to the cylinders and bearings, has been mounted on the 1913 car. The new radiator introduced for the 1912 season has been continued. Three-point suspension is continued for this season, a tubular cross-piece 2 inches in diameter forming the front supporting member. The entire motor is mounted on a slant to secure straight-line drive. In place of the expanding band type of clutch, which has been a Rambler feature, a leather-faced cone has been fitted. Instead of two brake rockershafts which were formerly carried separately, there is now but one, which is a combination of both, one within the other. The U. S. L. starting system consists of a motor-generator mounted integrally with the flywheel, a foot control, an automatic switch, and accumulator, a regulator and a large conduit.

R-C-H—Long Wheelbase Roadster

Full equipment is the slogan of the R. C. H. company and nothing has been spared in doing everything possible in this way for the new line. Little change in constructional details have been made, the principal innovation being the introduction of the long wheelbase roadster. This is placed on the touring car chassis of last year, the roadster of the 1912 season having been mounted on a chassis of shorter wheelbase. Electric lighting, rear-vision mirror, top cover, slip, Jiffy curtains, extra rim holders and Warner auto-meter are a part of the equipment which is fitted to these cars. Other refinements in the nature of changes are the mounting of the throttle control lever on the steering column and the mounting of a hand emergency brake, which was omitted on last year's car. No change whatever has been made in the four-cylinder monobloc motor. The gearset is mounted as a unit with the rear axle.

Regal—Overslung Model

In addition to the line of underslung cars, the Regal company has added a model which has the frame suspended over the axles. The new design is called model C and is a five-passenger touring car incorporating a new motor which has been specially designed for this chassis. The other models, of which there are four, are made on two chassis types, models T, N coupé being mounted on the smaller of the two and models H and S on the larger. These are both four-cylinder models and differ only in size. The new model has a four-cylinder monobloc motor with



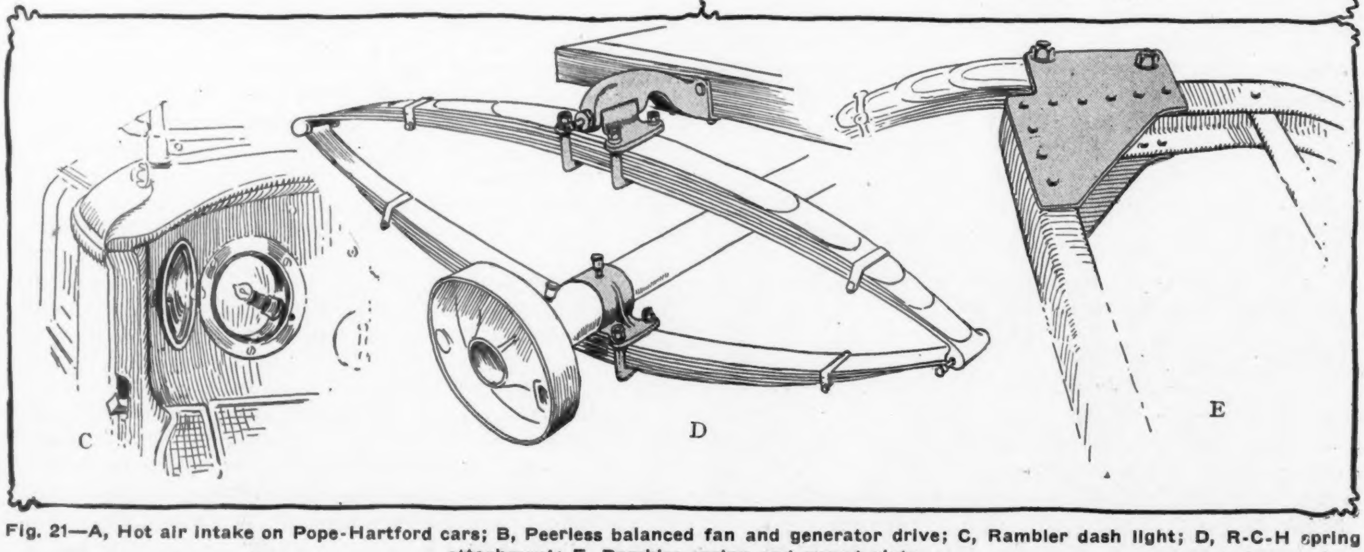


Fig. 21—A, Hot air intake on Pope-Hartford cars; B, Peerless balanced fan and generator drive; C, Rambler dash light; D, R-C-H spring attachment; E, Rambler spring and gusset plate

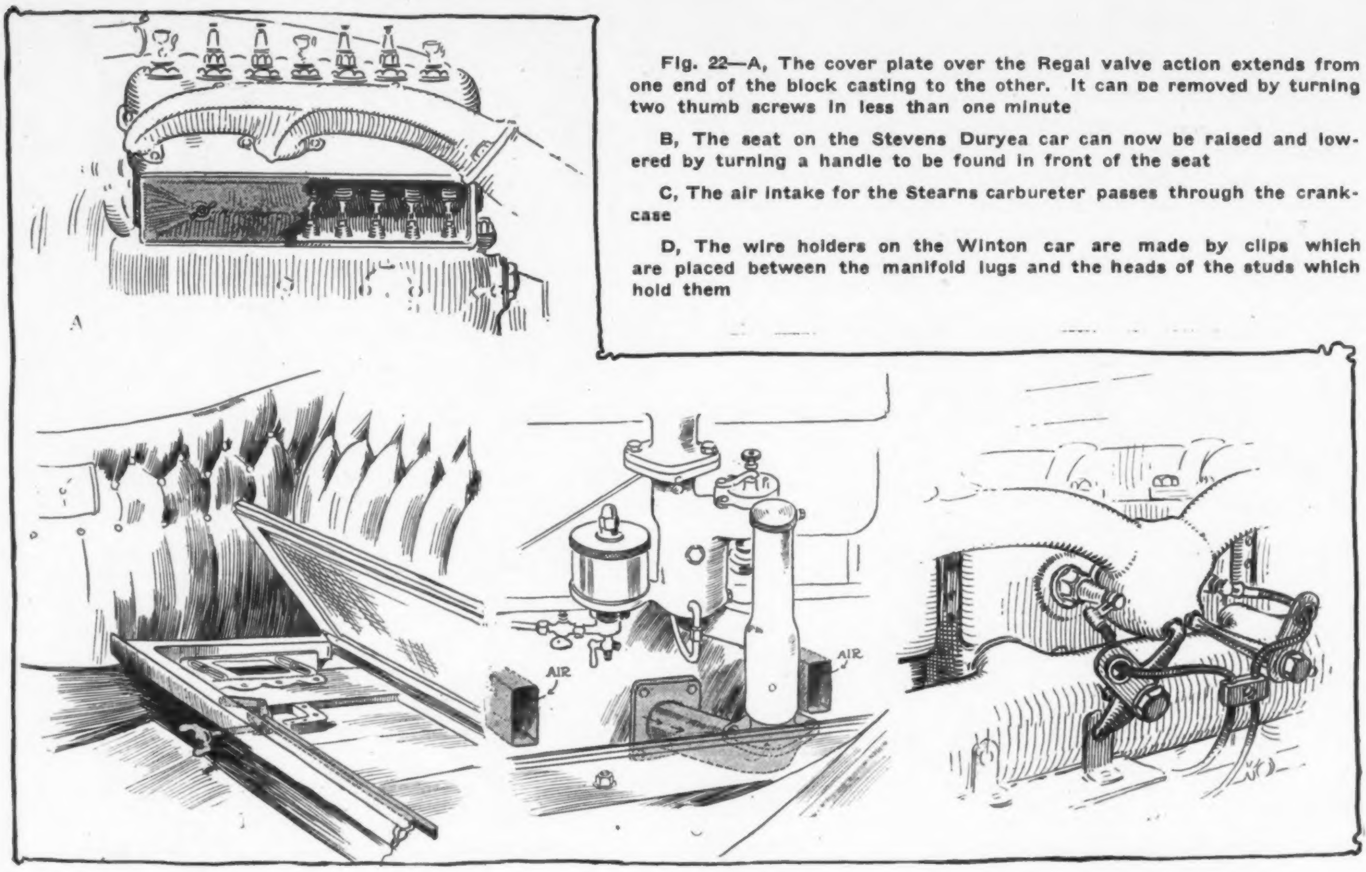


Fig. 22—A, The cover plate over the Regal valve action extends from one end of the block casting to the other. It can be removed by turning two thumb screws in less than one minute

B, The seat on the Stevens Duryea car can now be raised and lowered by turning a handle to be found in front of the seat

C, The air intake for the Stearns carbureter passes through the crankcase

D, The wire holders on the Winton car are made by clips which are placed between the manifold lugs and the heads of the studs which hold them

a bore of 4 inches and a stroke of 5 inches. The exhaust passages are integral with the block casting. The crankcase is aluminum and contains the constant-level splash system of lubrication. The clutch, gearset and springs are very similar to those used on the former Regal model, the frame, however, differs from the former frames in that it is overhung instead of the underslung type. The overhung frame permits of a direct suspension of the motor from the frame and three-quarter elliptic springs. Electric lights, demountable rims and speedometer are part of the equipment. Small changes in body construction, such as furnishing a greater curve to the seat backs and placing of fittings, form about the only changes in the models which have been continued.

Reo—Better Body

Among the improvements made by the Reo concern are greater size of tire both front and rear; electric side and tail lights, and a more expensive magneto. The motor which is rated at 30 horsepower, has four cylinders, cast in pairs. The bore is 4 inches and the stroke 4.5 inches. The valves are in the head of the cylinders. The carbureter is jacketed both for hot air and hot water. The 1913 body is wider and longer than that of the previous year, and it is also more highly and comfortably finished. Seventeen coats of paint are given the bodies while the hood, fenders, etc., have two coats of rubber enamel baked on. Left drive and center control are maintained. A storage battery provides current for the dash and tail lights which are of the combination electric and oil type.

Republic—Adds a Six

The most important development in the Republic line is the addition of the six-cylinder, 4.5 by 5-inch motor. This has its cylinders cast in pairs and its 2.25-inch valves on opposite sides of the cylinders. It is equipped with a special Stromberg carbureter to which the gasoline is fed under a pressure system. The gearset has four speeds and reverse. The clutch is a leather-faced cone with cork inserts. The wheelbase of this car is 133 inches. It is made in four standard styles of body, for two, four, five and seven passengers. It is magnificently upholstered and fully equipped. Delco lighting, starting and ignition is used. The Republic four appears on the 1913 market little different from a year ago. Small refinements have been made, and the equipment is more complete. The later production will be known as Series E and will embrace one more body than was offered prior to this series. This body is a two-passenger runabout which is applied to the same chassis as the other body styles, with the exception the 34 by 4-inch tires are used instead of 36 by 4 as on the other types. The leather-faced cone clutch with which the Republic is equipped is this year fitted with cork inserts. A special feature of the roadster is a trundle auxiliary seat which pulls out over the running board from beneath the front seat. An electric generator furnishes current for lighting and ignition.

Schacht—Electric Starting

The Schacht line for 1913 consists of two distinct body models built on one standard chassis. The touring model, N-S, and the model K-L roadster are both of the fore-door type. The motor for this season is 4.25 inches bore by 5.5 inches stroke and both cars have a wheelbase of 120 inches. Another feature of the line for this season is electric lighting and starting system which is operated with generator and storage battery. The cylinders on the motor are offset .625 inch from the center of the crankshaft. All bearings are Parsons white brass, and the crankcase is an aluminum casting. Floating rear axle, left drive and center control, 36 by 4 demountable rims, with one extra, and deep upholstery are features of this year's car.

Selden—Single Chassis

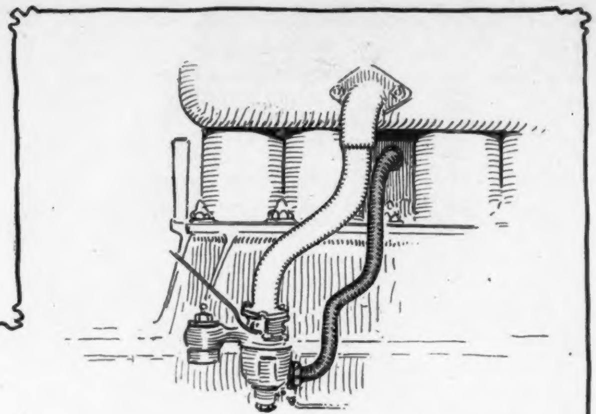
In conformance with its previous manner of production, the Selden enters the 1913 market with a single chassis, continued with few changes from former years. The effort that has been expended on the new series has been directed towards development of the design, in close adherence to former ideals. The Selden four-cylinder motor is practically unchanged, while the

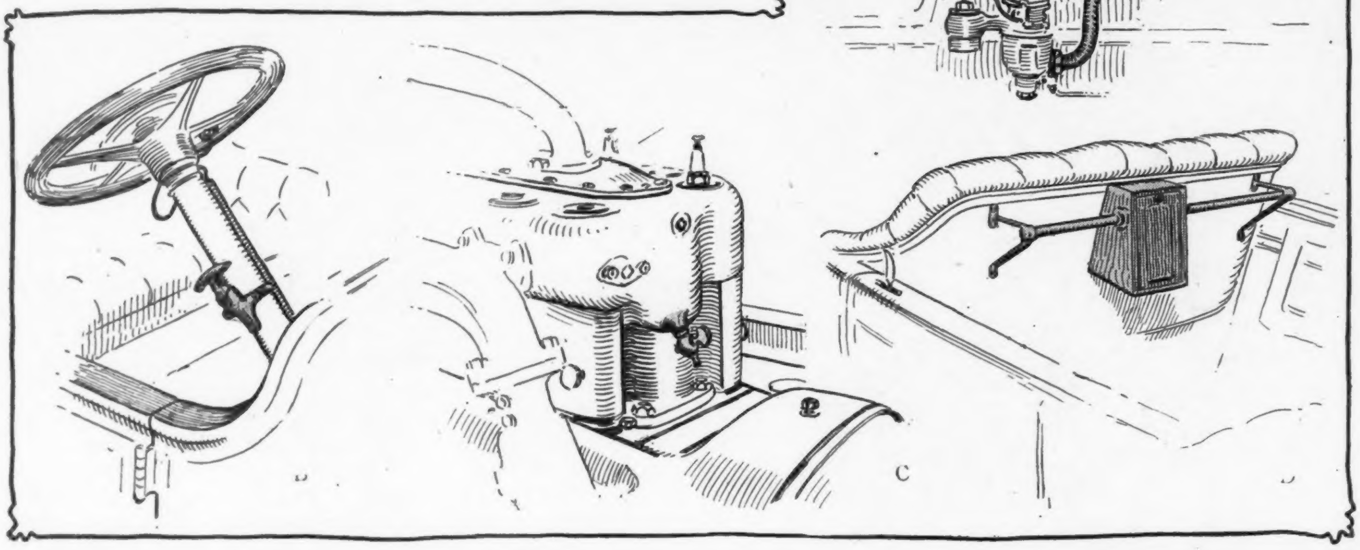
Fig. 24—A, The hot air intake of the Studebaker carbureter is taken from between the two blocks of cylinders

B, The acetylene starter control of the Studebaker cars is very convenient, being placed on the side of the steering post

C, In order that all the water may be drained from the cylinder jackets the Touraine car has a drain cock on the rear cylinder

D, A glove box has been placed on the robe rail of the Touraine car





dry multiple-disk clutch, adopted last year, has undergone no modifications. The principle changes are in the rear axle and in the use of the Gray & Davis starting system, in addition to the lighting system formerly employed. The brakes, formerly both internal, 14 by 1 3-4 inches, have been changed. The service brake operates on the outside of the same drum on which the internal emergency brake operates. The size of each has been increased to 16 by 2 inches. Five body styles will be furnished on this chassis, consisting of a two-passenger roadster, a four-passenger torpedo, a five-passenger touring car, a seven-passenger touring car and a seven-passenger limousine.

S. G. V.—Pressure Gasoline

The only change noted on the S. G. V. model is the substitution of pressure in place of gravity fuel feed on the Model A. Otherwise the line remains the same. The model D, 35-horsepower, differs from Model A, in that there are only three motor gears instead of five, the pump and magneto being operated on the same shaft. There is a spark advance on the Model D and none on the Model A.

Speedwell—Adopts Rotary Valve

Speedwell has made a most radical change in their policy for 1913. The rotary Mead valve motor has been adopted for a six-cylinder car just put on the market. The valves consist of two rotating cylinders carried in the head of the combustion space. They are driven by silent chain from the crankshaft and are lubricated by the oil which is mixed with the fuel. The cylinders have a bore of 4.125 inches and a stroke of 5.25 inches. The cars are equipped with Wagner starting and lighting system. The Mead motor weighs 754 pounds as compared to the 824 pounds of the poppet type used by the Speedwell company. Both have the same cylinder dimensions.

Staver—Adds a Four

Three Staver chassis will be on the market for 1913. They will be known as the 45, 55 and 65. The latest model, and the one which has been added to the line for this season, is the 45. It has a 4.5 by 5-inch motor giving an S. A. E. rating of 32.4 horsepower and developing on the brake, according to the makers, 49.6. The motor is of the T-head type with the cylinders cast en bloc. It is mounted on a sub-frame consisting of parallel members swung inside the side members of the main frame. An electric starting and lighting system is fitted to the car, although air starting is optional with the purchaser. Working in conjunction with the motor there is a Rayfield carbureter, Remy R. D. X. magneto, honeycomb radiator, and a splash system of lubrication. The clutch on this new model is a 38 disk type running in oil. The gearset has three speeds forward and is carried on Rhineland imported ball bearings. Left drive and center control has been incorporated, and all pedals are adjustable to suit the leg length of the driver. Semi-elliptic front and three-quarter elliptic rear springs are used held by a new type of double spring clip which is of square section to prevent loosening of nuts.

Stearns—New Knight Six

Although continuing its Knight type of motor practically unchanged since its adoption a little over a year ago, the F. B. Stearns Company has just announced a six-cylinder Knight motor equipped car. The bore of the six-cylinder car is the same as the four, namely, 4.5 inches, while the stroke is .25 inch longer than that of the four, or 5.75 inches. This new Knight creation adheres to the design principles which have been so carefully worked out for the earlier type, in most respects. The front end of the motor is hung on an arched cross-piece, bolted to the side rails of the frame, replacing the aluminum arm construction usually employed. A separate cross-member supports the radiator. The rear end of the motor is bolted to the side members of the frame by integral crankcase arms. A four-speed gearset is used, while final drive is through a propeller shaft equipped with two universal joints. Gray & Davis lighting and starting systems are fitted as standard equipment on the sixes. The new chassis is made in two lengths having 134 and 140-inch wheelbases for which six body styles are provided. The 134-inch wheelbase

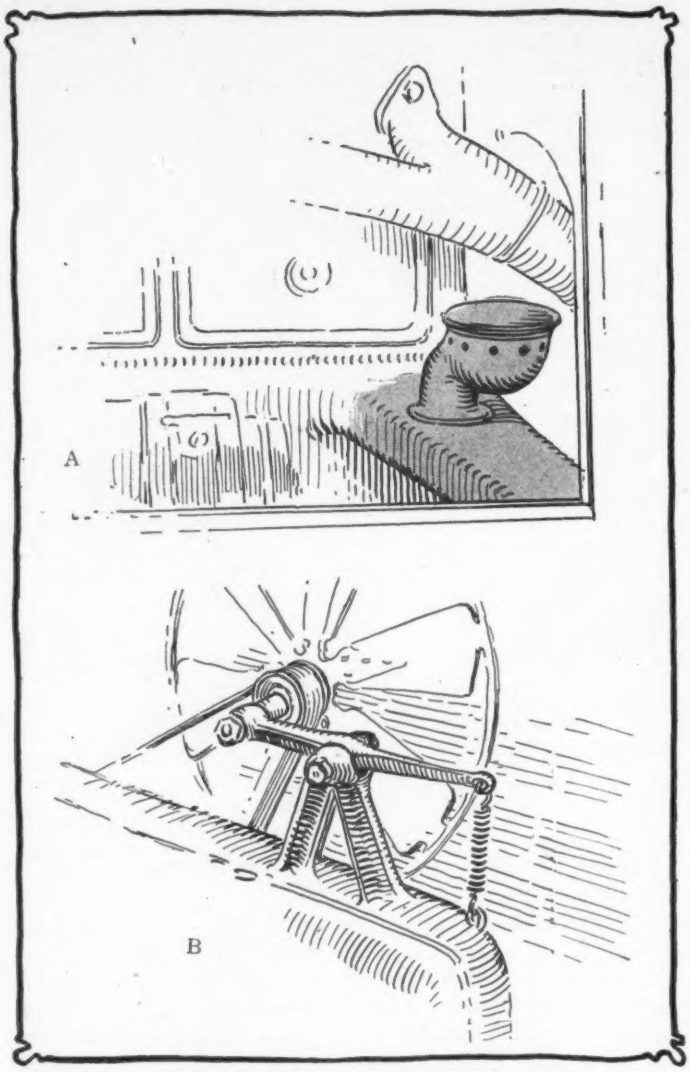


Fig. 24—A, Oil filler on S.G.V. cars; B, Spring tension on Velie fan belt

takes the three-passenger roadster, four-passenger light touring and five-passenger touring bodies, while the 140-inch wheelbase carries the seven-passenger touring type. Landaulet and limousine bodies are furnished for either chassis. The touring car bodies are all flush-sided with a narrow moulding around the bodies and doors. Running boards are clear, tires being carried at the rear on special brackets. Equipment is complete in every respect.

Stevens-Duryea—Only Sixes

Two six-cylinder chassis are made by the Stevens-Duryea Company for 1913. This is in line with the policy of this concern last year, but some minor refinements have been made. The motor is rated at 44.6 horsepower and has a bore of 4.3125 inches and a stroke of 5.5 inches. All types of bodies are fitted to this chassis. The Westlake dynamo will be incorporated on this year's cars, the valves will be inclosed, the oil leads will be inclosed, and one bolted-on valve cap will be placed over each exhaust and intake vave, one cap covering each pair of valves. The gravity feed gasoline is retained, but the running boards has been cleared. The tires are carried on the side. The starting system is by acetylene, the Prest-O-Lite tank being used in conjunction with a distributor of the Stevens-Duryea type. The wheelbases are 131 and 138 inches.

Stoddard-Dayton—Four Knights

Four models of Stoddard-Dayton cars will be produced by the United States Motor Car Company for the present season. The six-cylinder Knight car is, of course, the leader, while but one of the characteristic valve-in-the-head Stoddard-Dayton motors remains. Two smaller cars now use the L-head type of engine. Beginning with the sleeve-valve six, this car is fitted with left-hand drive and center control as last year's model was, and offers the option of wire wheels. Changes have been made in the design of the front axle, a new type of worm-and-sector steering gear is used, the radiator has been enlarged, new wheel-hub bearings have been fitted, and the control has been simplified. Model 48 is the only remaining model using the valve-in-the-head motor. It remains the same as last year in mechanical features, except for a few minor details which have been refined. The two L-head models 30 and 38 use engines cast en bloc with valve mechanisms inclosed, and show little deviation from former practices. All standard body types are fitted on each chassis with the exception of the 30, which takes a five-passenger touring, and a two-passenger roadster only. All body types have undergone refinement.

Studebaker—Adds a Six

Studebaker opens the season with three entirely new cars, two of them are four-cylinder types and the other is a 'six. Besides these three chassis, models 20 and 30 of last year are continued without radical change, making five distinct types now on the market. It will be remembered that the Flanders and E.M.F. cars are now given the name of Studebaker and that the model 20 referred to above was the Flanders 20, while the model 30 was the E.M.F. 30. Of particular interest are the three new models, which involve features new to Studebaker construction. A large number of parts are interchangeable on these three models. All the new motors of the L-head type with the cylinders cast en bloc and the valves on the left side. The exhaust and intake manifolds are cast integrally and so arranged that the gas enters the intake manifold on the side opposite the intake valves. The three models are known as the 25, 35 and 6. They all have the same stroke of 5 inches and models 25 and 6 have the same bore of 3.5 inches. The bore of the larger four-cylinder model is 4.125 inches. Three-bearing crankshafts are used in the four-cylinder cars and four-bearing crankshafts in the six-cylinder. The camshaft gears are of cast iron, while the crankshaft gear is of steel. A spiral pitch is used on these gears. The cams are integral with the camshaft as are also the oil-pump eccentrics. One feature of the new motors is the location of the water pump and magneto on brackets which bolt to the front end of the crankcase. The drive of these is accomplished by a transverse shaft driven by spiral gearing at its center from the crankshaft. Splash lubrication and Splitdorf dual ignition take care of these two important features, while starting and lighting is accomplished by the Wagner electric system. This system contains a motor-generator, geared 2.65 to 1, in relation to the crankshaft, furnishes the starting power and storing a six-cell, nine-plate storage battery of a capacity of 60 ampere-hours at a voltage of 12. The storage battery is placed on the left running board and the generator on the right side to maintain balance. On the 25 there is no starter, but an acetylene primer instead. The small car, model 25, has its driveshaft inclosed in a torque tube, but on the larger cars a stamped steel torque member is used. Three-speed gearsets are provided on all models, as is also the case with right control and drive.

Stutz—Puts Out a Sixes

In addition to the Stutz four-cylinder models a six is now on the market. Both have Esterline lighting and starting. It is of a similar design to the Stutz four-cylinder motors, but has a smaller bore and stroke, these dimensions being 4.25 by 5 inches. The Stutz four-cylinder motors, which are the same this year as last, have a bore of 4.75 inches and a stroke of 5.5 inches. It is of the T-head type with 2.5-inch valve. One of the added refinements this year is a hot waterjacket added to the intake manifold to warm the mixture before it enters the cylinders. In these motors the cylinders are offset .75 inch, and the con-

necting-rods are held at their big end by a four-bolt bearing cap giving a bearing 2 inches in diameter and 3.5 inches in length. The motors are lubricated by force feed through hollow crankshafts, the oil ducts being integral with the crankcase. Ignition system are the Splitdorf double distributer magneto on the four-cylinder roadster and the latest Eisemann magneto on all the other models. Exactly the same bodies are used on the four and six-cylinder models. The four-cylinder touring and the six roadster have a wheelbase of 120 inches, while all other bodies are put on a 124-inch wheelbase chassis. The six has a 130-inch wheelbase for the touring body. Some changes have been made in the Stutz rear system, although the general design is the same as has been used for the past 5 years, the differential case being about 2 inches larger in diameter. An outside adjustment has also been provided for adjusting the mesh between the drive pinion and the bevel gear. By removing two small plates on either side of the differential case an adjusting collar can be reached to move the drive gear in either direction. Right drive and control with inside levers are used on all models.

Spaulding—Drops Small Model

In the third year of motor car manufacture the Spaulding Manufacturing Company, Grinnell, Ia., has made additions to its plant, and expects to greatly increase its production for 1913. The Spaulding is designed along recognized and conservative lines, and has been little modified in its 1913 model. The small model has been dropped and the large one continued. The principal changes that have been made are the installation of the Gray & Davis electric lighting and starting system; an electric heating system; left-hand drive with center control; demountable rims with a spare; a tire holder in the rear, and modifications in the motor size. The motor has been changed from 4.125 x 5.25 to 4.25 x 5.5. Modifications are to be noticed in the oiling system; the valve-mechanisms have been inclosed; and the intake manifold is not cast integral with the cylinders, which are this year en bloc, instead of separate. A pressed-steel rear axle of the floating type is used. The wheelbase is 120 inches, and the tires are 36 by 4 instead of the corresponding dimensions of 117 and 34 inches of last year.

Velie—Adds New Four

In addition to the model 40 the Velie Dispatch has been put on the market. This is a new motor incorporating a large stroke bore ratio, the cylinder dimensions being 3.75 by 5.5 inches. The motor is rated at 32 horsepower at 1,000 revolutions. The cylinders are cast en bloc and many other features common to modern cars are involved. Among these may be mentioned silent chain drive for magneto and camshaft; enclosed valves and thermo-syphon cooling. The crankshaft is carried on three main bearings and has a diameter of 3.25 inches. The valves have a clear diameter of 7.125 inches. Among the other chassis features on this model are left drive and center control. A floating axle carried on roller bearings is also incorporated. The Velie 40, which is continued, has a bore of 4.5 inches, and a stroke of 5.25 inches. The makers claim that it develops 40 horsepower of 1,000 revolutions per minute and 50 horsepower at 1,600 revolutions per minute. A 1.25-inch double jet Stromberg carbureter is used on this model, while the ignition includes a Splitdorf high-tension magneto, and an Atwater Kent unit sparker. The clutch is a three-disk drive-plate type, fitted with an automatic clutch brake. The dynamo electric lighting system with five lamps and a Disko starter are included in the Velie equipment.

Winton—Changes Springs

Three-quarter elliptic rear springs, suspended outside the frame rails, are the chief point of difference between the Winton car of 1913 and its predecessors. Otherwise the current line presents small variation from last year's cars. The cowl is given a trifle less angle and the doors have been trimmed slightly with handles placed inside the body. Ventilation has been improved in minor details. The change in springs gives the opportunity to curve down the rear of the body without a break, which has been done with pleasing effect. Trifling changes have been made in the upholstering, designed to augment riding comfort.

White—Three Models

Monoblock castings and long stroke are characteristics of White gasoline productions. The leader of the line is the White six cylinder which is now in its second season, having been shown first in 1912. Embodying many refinements, this model, with the 30 and 40 of last year, has been continued on the series production plan. The new 30 has been redesigned with left-side drive and center control the same as the six and the 40. The current models are in the order mentioned, models GF, GAF and GEB. The six model has its six cylinders in a single casting, all valves on the right side with inclosed mechanisms and 4.25 by 5.75-inch bore and stroke. Three ball bearings are used as engine journals and both manifolds are integral with the cylinders. This, with conduited wires and concealed water passages, imparts a pleasing, clean appearance to the motor. Two fans are used in connection with the pump-circulated water-cooling system, one of which is behind the radiator and the other the vaned flywheel. A carbureter of White design is used, and a compression-relief is fitted for starting. The electric starter is a part of the White electric lighting and starting system, which is of the single-unit type, the dynamo fulfilling both the functions of a motor and a generator for charging the battery. This system is used on all models. General chassis details on the six differ only in dimensions from the other models. Body types include touring cars, roadsters, limousines and Berline limousines and coupés.

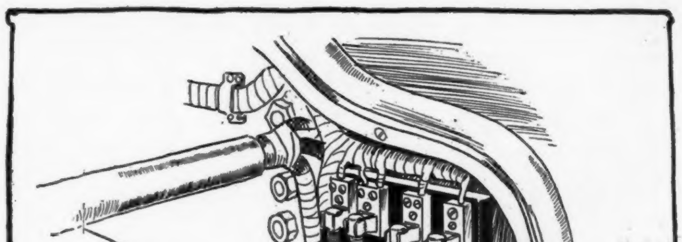


Fig. 25—A, Fuse box of White dash; B, Jacket plates on Touraine six

Passenger Car Chassis Listed for 1913

THE AUTOMOBILE Publishes Herewith Its Annual Table of Complete Mechanical Specifications of Practically Every Gasoline Passenger Chassis Produced by the Automobile Factories of America for the Season of 1913

1					CYLINDERS		VALVES			COOLING		LUBRICATION		IGNITION			CARBURETION		ENGINE STARTER	
NAME AND MODEL	No. of Cylinders	Bore and Stroke, Inches	S. A. E. H. P.	Piston Displacement Cubic Inches	Shape	How Cast	Type	Location	Camshaft Drive	Circulation	Radiator	System	Type of Pump	System	Magneto Generator	Control	Make of Carbureter	Fuel Feed	Type	Make
Abbott-Detroit, D	4	4.13x5.25	27.30	280.6	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Piston	Dual	Spld'rf	Hand	Mayer	Grav	Elec	Auto-Lite
Abbott-Detroit, E	4	4.50x5.50	32.40	349.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Piston	Dual	Spld'rf	Hand	Mayer	Grav	Elec	Auto-Lite
Adams-Farwell, 9	5	5.50x5.00	60.00	594.0	Straight	Sep'rt	Poppet	Head	Gear	Air		Pressure	Noncir	Dual	Optional	Hand	Own	Pres	Lever	Own
A. E. C., 6-45	6	3.75x5.50	33.80	364.4	L Head	Block	Poppet	Left	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand	Rayfield	Pres	Elec	Own
A. E. C., 6-60	6	4.25x5.00	43.80	425.4	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand	Rayfield	Pres	Air	
Alco, 7-16	4	3.94x4.25	24.00	207.0	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-pres	Gear	Sing	Bosch	Fixed	Stromberg	Grav		
Alco, 11-60	6	4.75x5.50	54.10	584.9	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-pres	Gear	Dual	Bosch	Hand	Newcomb	Pres		
Alpena, N-50	6	3.75x5.25	33.75	347.8	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash		Dual		Hand	Zenith	Pres	Elec	Electro
Alpena, P-40	4	3.75x5.25	22.50	272.1	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash		Dual		Hand	Zenith	Pres	Elec	Electro
American Scout, 22 A*	4	3.75x5.00	22.50	220.9	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Eisemann	Hand	Rayfield	Pres	Acet	Disco
American Tour., 34 A*	4	4.50x5.00	32.40	318.1	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Eisemann	Hand	Rayfield	Pres	Acet	Disco
American Trav., 54 A*	4	5.38x5.50	46.00	499.2	L Head	Pairs	Poppet	Right	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Rayfield	Pres	Elec	Peru
American Trav., 56 A*	4	5.38x5.50	46.00	499.2	L Head	Pairs	Poppet	Right	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Rayfield	Pres	Elec	Peru
American Road, 32 A*	4	4.50x5.00	32.40	318.1	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Eisemann	Hand	Rayfield	Pres	Acet	Disco
Ames, 44 & 45	4	4.13x5.25	27.30	280.6	L Head	Block	Poppet	Left	Gear	Pump	Tub	Spl-pres	Piston	Dual	Remy	Hand	Schebler	Grav	Acet	Disco
Apperson, 4-45	4	4.50x5.00	32.40	318.1	T Head	Sep'rt	Poppet	Head	Gear	Pump	Cell	Splash	Gear	Dual	National	Hand	Rayfield	Grav	Elec	Ward-L'd
Apperson, 4-55	4	4.75x5.00	36.10	354.4	T Head	Sep'rt	Poppet	Head	Gear	Pump	Cell	Splash	Gear	Dual	National	Hand	Rayfield	Grav	Elec	Ward-L'd
Apperson, 4-55	4	4.75x5.00	36.10	354.4	T Head	Sep'rt	Poppet	Head	Gear	Pump	Cell	Splash	Gear	Dual	National	Hand	Rayfield	Grav	Elec	Ward-L'd
[illegible], F. G. H	4	4.13x5.50	27.30	294.0	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Spl-pres	Gear	Dual		Hand	Schebler	Grav	Elec	
[illegible]	4	4.50x5.50	32.40	349.9	Knight	Pairs	Sleeve	Opp	Chain	Pump	Tub	Pressure	Piston	Sing	Deaco	Hand	Stromberg	Grav	Elec	Gray & Da.
Auburn, 33L	4	3.75x5.25	22.50	231.9	L Head	Block	Poppet	Opp	Gear	Pump	Tub	Splash	Piston	Dual	Remy	Hand	Schebler	Grav		
Auburn, 37L	4	4.25x4.75	28.90	269.4	L Head	Block	Poppet	Left	Gear	Pump	Tub	Splash	Piston	Dual	Remy	Hand	Schebler	Grav		
Auburn, 40L	4	4.50x5.00	32.40	318.1	L Head	Sep'rt	Poppet	Left	Gear	Pump	Tub	Splash	Piston	Dual	Remy	Hand	Schebler	Grav		
Auburn, 6-45	6	3.75x5.25	33.75	347.8	L Head	Pairs	Poppet	Opp	Gear	Pump	Tub	Splash	Piston	Dual	Remy	Hand	Schebler	Grav		
Auburn, 6-50	6	4.13x5.25	40.80	420.9	L Head	Sep'rt	Poppet	Left	Gear	Pump	Tub	Splash	Piston	Doub	Bosch	Hand	Schebler	Grav		
Austin, 55	6	4.00x5.00	38.40	376.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Gear	Dual 2	Spld'rf	Hand	Rayfield	Grav	Air	Own
Austin, 66	6	4.50x7.00	48.60	667.9	T Head	Sep'rt	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Noncir	Dual 2	Spld'rf	Hand	Rayfield	Grav	Air	Own
Austin, 77	6	4.50x7.00	48.60	667.9	T Head	Sep'rt	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Noncir	Dual 2	Spld'rf	Hand	Rayfield	Grav	Air	Own
Bergdoll, 30	4	4.00x4.50	25.60	226.2	L Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Piston	Sing	Bosch	Hand	Schebler	Grav	Elec	U. S. L.
Bergdoll, 40	4	4.00x5.94	25.60	298.5	L Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Piston	Sing	Bosch	Hand	Schebler	Grav	Elec	U. S. L.
Bergdoll, 40	4	4.00x5.94	25.60	298.5	L Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Piston	Sing	Bosch	Hand	Schebler	Grav	Elec	U. S. L.
Buick, 25, 24	4	3.75x3.75	22.50	165.5	Straight	Pairs	Poppet	Head	Hel'l	Pump	Tub	Splash	Gear	Dual	Remy	Hand	Schebler	Grav	Acet	Disco
Buick, 31, 30	4	4.00x4.00	25.60	201.1	Straight	Pairs	Poppet	Head	Hel'l	Pump	Tub	Splash	Noncir	Dual	Remy	Hand	Schebler	Grav	Acet	Disco
Buick, 40	4	4.25x4.50	28.90	255.3	Straight	Pairs	Poppet	Head	Hel'l	Pump	Tub	Splash	Noncir	Dual	Remy	Hand	Schebler	Grav	Acet	Disco
Burg, S	6	3.75x5.25	33.75	347.8	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Spl-pres	Piston	Dual	Bosch	Hand				
Burg, R	6	4.13x5.25	40.80	420.9	L Head	Sep'rt	Poppet	Right	Gear	Pump	Cell	Spl-pres	Piston	Dual	Bosch	Hand				
Cadillac, 1913	4	4.50x5.75	32.40	365.8	L Head	Sep'rt	Poppet	Right	Chain	Pump	Tub	Splash		Doub	Delco	Hand	Own	Grav	Elec	Delco
Cameron, 29 A	4	3.88x3.75	24.00	176.9	Straight	Sep'rt	Poppet	Head	Gear	Air		Spl-pres	Gear	Sing		Hand	Kingston	Grav		
Cameron, 28	4	3.88x3.75	24.00	176.9	Straight	Sep'rt	Poppet	Head	Gear	Air		Spl-pres	Gear	Sing		Hand	Kingston	Grav		
Cameron, 30	6	3.88x3.75	36.07	265.4	Straight	Sep'rt	Poppet	Head	Gear	Air		Spl-pres	Gear	Sing		Hand	Kingston	Grav		
Cameron, 32	6	3.88x3.75	36.07	265.4	Straight	Sep'rt	Poppet	Head	Gear	Air		Spl-pres	Gear	Sing		Hand	Kingston	Grav		
Carhartt, K	4	4.07x4.50	26.40	285.0	L Head	Block	Poppet	Right	Gear	Pump	Cell	Splash		Doub		Hand	Stromberg			
Carhartt, B	4	4.50x5.50	32.40	349.9	L Head	Pairs	Poppet		Gear	Pump	Cell	Splash		Dual		Hand	Stromberg	Grav		
Carroll, 4 E	4	4.50x5.50	32.40	349.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash		Doub	Optional	Hand	Rayfield	Pres	Mech	National
Carroll, 4 D	4	5.00x5.00	40.00	392.7	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Doub	Optional	Hand	Rayfield	Pres	Mech	National
Carroll, 6 C	6	4.13x5.25	40.90	420.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash		Doub	Optional	Hand	Rayfield	Pres	Mech	National
Cartercar, 5	4	4.13x4.75	27.25	253.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-pres	Noncir	Dual		Hand	Schebler	Grav	Elec	Jesco
Case, N	4	4.13x5.25	27.25	420.9	L Head	Block	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Opt	Remy	Hand	Rayfield	Pres		
Case, O	4	4.50x5.25	32.40	334.0	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Opt	Optional	Hand	Rayfield	Pres	Elec	Westing'se
Chadwick, 19—Road	6	5.00x6.00	60.00	706.8	L Head	Pairs	Poppet	L&H.	Gear	Pump	Cell	Pressure	Noncir	Doub	Bosch	Hand	Own	Pres	Opt	Optional
Chadwick, 19—Touring	6	5.00x6.00	60.00	706.8	L Head	Pairs	Poppet	L&H.	Gear	Pump	Cell	Pressure	Noncir	Doub	Bosch	Hand	Own	Pres	Opt	Optional
Chalmers, 17	4	4.25x5.25	28.90	297.8	Straight	Block	Poppet	L&H.	Gear	Pump	Cell	Splash	Gear	Dual	Spld'rf	Hand	Rayfield	Pres	Air	Own
Chalmers, 18	6	4.25x5.25	43.80	446.7	Straight	Threes	Poppet	L&H.	Gear	Pump	Cell	Splash	Gear	Dual	Spld'rf	Hand	Rayfield	Pres	Air	Own
Chevrolet, C	6	3.55x5.00	30.20	298.9	T Head	Threes	Poppet	Opp	Gear	Pump		Splash	Noncir	Dual		Hand		Grav	Air	English
Cino, 450	4	4.50x6.00	32.40	381.7	T Head	Block	Poppet	Opp		Pump	Tub	Spl-Pres	Gear	Dual	Optional	Hand	Rayfield	Grav		
Cino, 440	4	4.50x5.00	32.40	318.1	T Head	Block	Poppet	Opp	Hel'l	Pump	Tub	Spl-Pres	Gear	Dual	Optional	Hand	Rayfield	Grav		
Cino, 660	6	4.00x6.00	38.40	452.4	T Head	Block	Poppet	Opp	Gear	Pump	Tub	Spl-Pres	Gear	Dual	Optional	Hand	Rayfield	Grav	Elec	Electro

*Underslung Frame. †Has six wheels.

ABBREVIATIONS:—Model: Tour, touring; Road, roadster. **Cylinders:** Sep'rt, separate. **Valve Location:** Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. **Camshaft Drive:** Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. **Cooling Circulation:** Thermo, thermo-syphon. **Radiator:** Cell, cellular; Tub, tubular. **Lubrication:** Spl-Pres, combined splash and pressure system in circulating unless called Noncir. **Ignition:** Sing single; Doub, double; Dual 2, double distributer; Gov, governor; Atw Kent, Atwater Kent. **Fuel Feed:** Grav, gravity; Pres, pressure. **Engine Starter:** Spr, spring; Elec, electric; Acet, acetlyene; Mech, mechanical; Opt, optional; Air, compressed air. **Bore and Stroke:** In decimals to nearest 1-100 inch, as 4.25=$4\frac{1}{4}$, etc., .06=$\frac{1}{16}$, .19=$\frac{3}{16}$, .13=$\frac{1}{8}$, .25=$\frac{1}{4}$, .31 $\frac{5}{16}$=, .38=$\frac{3}{8}$, .44=$\frac{7}{16}$, .5=$\frac{1}{2}$, .56=$\frac{9}{16}$, .63=$\frac{5}{8}$, .69=$\frac{11}{16}$, .75=$\frac{3}{4}$, .81=$\frac{13}{16}$, .88=$\frac{7}{8}$.

Horsepower and Mechanical Details

In Calculating the Horsepower of the Motors Given in the Table the S. A. E. Formula Was Followed—That Is, Horsepower Equals Cylinder Bore Squared, Multiplied by the Number of Cylinders Divided by 2.5.

TRANSMISSION								RUNNING GEAR								CONTROL			BEARINGS				1
	GEARSET								TIRES		WHEELS		SPRINGS										
Clutch Type	Type	Location	Forward Speeds	Drive	Car Drives Through	Rear Axle	Total Gear Ratio on High	Wheelbase	Front	Rear	Kind	Attachment	Front	Rear	Front Axle	Location Steering Wheel	Gearshift Location	Emergency Brake Control	Crankshaft Type and No.	Gearset	Rear Axle	Front Wheel	Chassis Weight, Lbs.
Disk....	Sel ...	Unit M .	3	Bevel...	Rad. Rd ..	Float .	3.50-1	116	34x4	34x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 3 .	Roll ..	Roll ..	Roll ..	2,250
Disk....	Sel ...	Unit M .	3	Bevel...	Rad. Rd ..	Float .	3.50-1	121	36x4½	36x4½	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 3 .	Roll ..	Roll ..	Roll ..	2,850
Cone ...	Sel ...	Amid ...	3	Chain...	Rad. Rd ..	Semi F	....	120	36x4½	36x4½	Wood	....	½ Ell..	½ Ell..	Square..	Right...	Right.	Right.	Plain, 2 .	Ball ..	Roll ..	Roll ..	....
Disk....	Sel ...	Unit M .	3	Bevel...	Rad. Rd ..	Float .	3.50-1	130	36x4½	36x4½	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Left	Cent.	Cent..	Plain, 4 .	Ball ..	Roll ..	Roll ..	2,000
Disk....	Sel ...	Amid ...	4	Bevel...	Rad. Rd ..	Float .	2.63-1	138	37x5	37x5	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 4 .	Ball ..	Roll ..	Roll ..	2,500
Disk....	Sel ...	Amid ...	3	Bevel...	Rad. Rd ..	Float .	3.80-1	104	32x4	32x4	Wood	....	½ Ell..	½ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 3 .	Ball ..	Ball ..	Ball ..	2,420
Disk....	Sel ...	Amid ...	4	Bevel...	Rad Rd...	Float .	3.61.1	133½	36x4½	37x5	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 5 .	Ball ..	Ball ..	Ball ..	3,560
Disk ...	Sel ...	....	......	Bevel...	Springs....	Float .	3.50-1	135	36x4	36x4	......		....	....	I-Beam .	Opt	Cent..	Cent..	Plain, 4 .	Plain .	Ball ..	Ball ..	....
Disk....	Sel ...	....	......	Bevel...	Springs....	Float .	3.50-1	135	36x4	36x4					I-Beam .	Opt	Cent..	Cent..	Plain, 4 .	Plain .	Ball ..	Ball ..	....
Cone ...	Sel ...	Amid ...	3	Bevel...	Tor T	Float .	4.07-1	105	36x3½	36x3½	Wood	....	½ Ell..	½ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 3 .	Ball ..	Ball ..	Ball ..	2,000
Cone ...	Sel ...	Amid ...	3	Bevel...	Tor T	Float .	3.20-1	118	37x4	37x4	Wood	....	½ Ell..	½ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 3 .	Ball ..	Ball ..	Ball ..	2,150
Cone ...	Sel ...	Amid ...	4	Bevel...	Tor T	Float .	4.02-1	124	40x4	41x4½	Wood	....	½ Ell..	½ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 3 .	Ball ..	Ball ..	Ball ..	3,000
Cone ...	Sel ...	Amid ...	4	Bevel...	Tor T	Float .	4.29-1	140	41x4½	41x4½	Wood	....	½ Ell..	½ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 3 .	Ball ..	Ball ..	Ball ..	3,100
Cone ...	Sel ...	Amid ...	3	Bevel...	Tor T	Float .	3.20-1	118	37x4	37x4	Wood	....	½ Ell..	½ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 3 .	Ball ..	Ball ..	Ball..	2,150
Disk....	Sel ...	Uint M .	3	Bevel...	Springs....	Float .	3.50-1	118	36x4	36x4	Wood	....	½ Ell. ¾	Ell...	I-Beam .	Left	Cent..	Cent..	Plain, 3 .	Roll .	Ball ..	Ball ..	2,100
Con Bd .	Sel ...	Amid ...	3	Bevel...	Tor T	Semi F	3.50-1	114	34x4	34x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 5 .	Ball ..	B&R..	Ball ..	2,300
Con Bd .	Sel ...	Amid ...	3	Bevel...	Tor T	Semi F	3.50-1	118	36x4	36x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 5 .	Ball ..	B&R..	Ball ..	2,800
Con Bd .	Sel ...	Amid ...	3	Bevel...	Tor T	Semi F	3.50-1	122	36x4½	36x4½	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 5 .	Ball ..	B&R..	Ball ..	3,000
Cone ...	Sel ...	Unit X .	3	Bevel...	Rad Rd...	Float .	....	120	36x4	36x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Left	Cent..	Cent..	Plain, 3 .	Ball ..	Ball ..	Roll ..	2,900
Disk....	Sel ...	Unit X .	3	Worm..	Tor T	Float .	3.85-1	130	37x5	37x5	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Left	Cent..	Cent..	Plain, 5 .	Ball ..	Ball ..	Roll ..	3,000
Cone ...	Sel ...	Amid ...	3	Bevel...	Rad Rd...	Semi F	3.50-1	112	34x3½	34x3½	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 3 .	Ball ..	Ball ..	Roll ..	2,500
Disk....	Sel ...	Unit M .	3	Bevel...	Rad Rd...	Float .	3.50-1	115	35x4	35x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 3 .	Ball ..	Ball ..	Ball ..	2,850
Cone ...	Sel ...	Amid ...	3	Bevel...	Rad Rd...	Float .	3.50-1	122	36x4	36x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 5 .	Ball ..	Ball ..	Ball ..	2,950
Cone ...	Sel ...	Amid ...	3	Bevel...	Rad Rd...	Float .	3.50-1	130	36x4	36x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 4 .	Ball ..	Ball ..	Ball ..	3,100
Disk....	Sel ...	Amid ...	3	Bevel...	Rad Rd...	Float .	3.50-1	135	37x4½	37x4½	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 7 .	Ball ..	Ball ..	Ball ..	3,450
Disk....	Sel ...	Amid ...	4	Bevel...	Springs....	Float .	....	141	37x5	37x5	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Left	Cent..	Pedal..	Plain, 4 .	Ball ..	Ball ..	Ball ..	....
Disk....	Sel ...	Amid ...	4	Bevel...	Springs....	Float .	....	141	37x5	37x5	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Left	Cent..	Pedal..	Plain, 7 .	Ball ..	Ball ..	Ball ..	....
Disk....	Sel ...	Amid ...	4	Bevel...	Springs....	Float .	....	141	37x5	37x5	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Left	Cent..	Pedal..	Plain, 7 .	Ball ..	Ball ..	Ball ..	....
Disk....	Sel ...	Unit M .	3	Bevel...	Springs....	Float .	3.75-1	115	34x4	34x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Ball, 2 ..	Ball ..	Ball ..	Ball ..	2,500
Disk....	Sel ...	Unit M .	4	Bevel...	Springs....	Float .	2.80-1	121	36x4	36x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Ball, 2 ..	Ball ..	Ball ..	Ball ..	2,600
Disk....	Sel ...	Unit M .	4	Bevel...	Springs....	Float .	2.80-1	115	34x4	34x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Ball, 2 ..	Ball ..	Ball ..	Ball ..	2,500
Cone ...	Sel ...	Amid ...	3	Bevel...	Rad Rd...	Semi F	4.00-1	105	32x3½	32x3½	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 3 .	Roll ..	B&R ..	Ball ..	2,000
Cone ...	Sel ...	Unit M .	3	Bevel...	Tor T	Semi F	4.00-1	108	34x4	34x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 3 .	Ball ..	B&R..	Ball ..	2,600
Cone ...	Sel ...	Unit M .	3	Bevel...	Tor T	Float .	3.75-1	115	36x4	36x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 3 .	B&P .	Ball ..	Ball ..	2,870
Disk....	Sel ...	Unit M .	3	Bevel...	S & T T ..	....	....	124	36x4	36x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Opt	Cent..	Pedal..	Plain, 5 .	Ball ..	Ball ..	Ball ..	2,000
Disk....	Sel ...	Unit M .	3	Bevel...	S & T T ..	Float .	4.00-1	134	36x4½	36x4½	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Cent..	Cent..	Plain, 7 .	Ball ..	Ball ..	Ball ..	2,700
Cone ...	Sel ...	Amid ...	3	Bevel...	S& T T ..	Float .	3.50-1	120	36x4½	36x4½	Wood	....	½ Ell..	¾ Plat	I-Beam .	Right...	Right.	Right.	Plain, 5 .	Ball ..	Roll ..	Roll ..	....
Cone ...	Sel ...	Unit X .	3	Bevel...	Tor T.....	Float .	3.00-1	110	32x3½	32x3½	Wood	....	½ Ell..	Ell ...	Tube....	Right...	Right.	Cent..	Plain, 3 .	Plain .	Ball ..	Ball ..	1,700
Cone ...	Sel ...	Unit X .	3	Bevel...	Tor T.....	Float .	3.00-1	104	32x3	32x3	Wood	....	½ Ell..	Ell ...	Tube....	Right...	Right.	Right.	Plain, 3 .	Plain .	Ball ..	Ball ..	1,485
Cone ...	Sel ...	Unit X .	3	Bevel...	Tor T.....	Float .	3.00-1	114	34x3½	34x3½	Wood	....	½ Ell..	Ell ...	Tube....	Right...	Right.	Right.	Plain, 3 .	Plain .	Ball ..	Ball ..	1,600
Cone ...	Sel ...	Unit X .	3	Bevel...	Tor T.....	Float .	3.00-1	120	34x3½	34x3½	Wood	....	½ Ell..	Ell ...	Tube....	Right...	Cent..	Cent..	Plain, 3 .	Plain .	Ball ..	Ball ..	1,800
Cone ...	Sel ...	Amid ...	3	Bevel...	Tor T.....	Float .	3.50-1	109	34x4	34x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 3 .	......	Roll ..	Ball ..	2,350
Cone ...	Sel ...	Amid ...	3	Bevel...	Tor T.....	Float .	3.50-1	119	34x4	34x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 3 .	......	Roll ..	Roll ..	2,950
Disk....	Sel ...	Amid ...	4	Bevel...	R & T R...	Float .	....	118	36x4	36x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Opt	Right.	Right.	Plain, 3 .	Ball ..	Roll ..	Roll ..	2,850
Disk....	Sel ...	Amid ...	4	Bevel...	R & T R...	Float .	....	128	36x4½	36x4½	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Opt	Right.	Right.	Plain, 3 .	Ball ..	Roll ..	Roll ..	3,500
Disk....	Sel ...	Amid ...	4	Bevel...	R & T R...	Float .	....	128	36x4½	36x4½	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Opt	Right.	Right.	Plain, 5 .	Ball ..	Roll ..	Roll ..	3,750
....	Frict .	....	......	Chain...	Rad Rd...	Float .	....	116	36x4	36x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 3 .	Plain .	Ball ..	Ball ..	2,350
Disk....	Sel ...	Unit M .	3	Bevel...	Springs....	Float .	3.50-1	115	34x4	34x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Cent..	Cent..	Plain, 3 .	Plain .	Ball ..	Ball ..	....
Disk....	Sel ...	Amid ...	3	Bevel...	Springs....	Float .	3.50-1	125	37x4½	37x4½	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 3 .	Roll ..	Roll ..	Roll ..	3,500
Exp Bd .	Sel ...	Amid ...	4	Chain...	Rad Rd...	Dead .	2.00-1	112	36x4½	36x4½	Wood	....	½ Ell..	Plat ..	I-Beam .	Right...	Right.	Right.	Plain, 4 .	Ball ..	Ball ..	Ball ..	2,700
Exp Bd..	Sel ...	Amid ...	4	Chain...	Rad Rd...	Dead .	2.25-1	133	36x4½	37x5	Wood	....	½ Ell..	Plat ..	I-Beam .	Right...	Right.	Right.	Plain, 4 .	Ball ..	Ball ..	Ball ..	3,000
Disk....	Sel ...	Unit M .	4	Bevel...	Tor R	Float .	3.75-1	118	36x4	36x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Ball, 2 ..	Roll ..	Roll ..	Roll ..	2,774
Disk....	Sel ...	Unit M .	4	Bevel...	Tor R	Float .	3.75-1	130	36x4½	36x4½	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Ball, 3 ..	Roll ..	Roll ..	Roll ..	3,173
Cone ...	Sel ...	Unit X .	3	Bevel....	Tor T.....	Float .	....	120	35x4½	35x4½	Wood	....	½ Ell..	¾ Plat	I-Beam .	Left	Cent..	Right.	Plain, 3 .	Plain .	Roll ..	Ball ..	....
Cone ...	Sel ...	....	3	Bevel...	....	Float .	....	120	34x4	34x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Cent..	Cent..	Plain, 3 .	Ball ..	Ball ..	Roll ..	....
Cone ...	Sel ...	Unit X .	3	Bevel...	....	Float .	3.50-1	120	34x4	34x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Cent..	Cent..	Plain, 3 .	Ball ..	Ball ..	Roll ..	2,422
Cone ...	Sel	....	3	Bevel...	S & T T ..	Float .	3.75-1	132	36x4½	36x4½	Opt ..	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Cent..	Cent..	Plain, 3 .	Ball ..	Ball ..	Roll ..	3,560

ABBREVIATIONS:—Clutch Type: Exp Bd, expanding band; Con Bd, contracting band. **Gearset:** Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; Unit M, unit with motor; Unit X, unit with rear axle; Amid, amidships. **Drive:** Bevel, shaft with bevel gear at rear axle; Worm, shaft with worm gear at rear axle. **Car Drives through:** Tor T, torsion tube; S & T T, springs and torsion tube; R & T R, radius rods and torsion rod; Rad Rd, radius rods; S & R R, springs and radius rods; Tor Rd, torsion rod. **Rear Axle:** Float, floating; Semi-F, semi-floating; ¾ Float, ¾ floating. **Wheel Attachment:** Dem, demountable. **Springs:** ½ Ell, semi-elliptic; Ell, elliptic; ¾-Ell, ¾ elliptic; Plat, platform. **Front Axle:** Tub, tubular. **Control Location Steering:** Cent, center. **Bearings:** Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller; B R & P, ball, roller and plain.

Passenger Car Chassis Listed for 1913

THE AUTOMOBILE Publishes Herewith Its Annual Table of Complete Mechanical Specifications of Practically Every Gasoline Passenger Chassis Produced by the Automobile Factories of America for the Season of 1913

1					CYLINDERS		VALVES			COOLING		LUBRICATION		IGNITION			CARBURETION		ENGINE STARTER	
NAME AND MODEL	No. of Cylinders	Bore and Stroke, Inches	S. A. E. H. P.	Piston Displacement Cubic Inches	Shape	How Cast	Type	Location	Camshaft Drive	Circulation	Radiator	System	Type of Pump	System	Magneto Generator	Control	Make of Carbureter	Fuel Feed	Type	Make
Abbott-Detroit, D	4	4.13x5.25	27.30	280.6	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Piston	Dual	Spld'rf	Hand	Mayer	Grav	Elec	Auto-Lite
Abbott-Detroit, E	4	4.50x5.50	32.40	349.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Piston	Dual	Spld'rf	Hand	Mayer	Grav	Elec	Auto-Lite
Adams-Farwell, 9	5	5.50x5.00	60.00	594.0	Straight	Sep'rt	Poppet	Head	Gear	Air	....	Pressure	Noncir	Dual	Optional	Hand	Own	Pres	Lever	Own
A. E. C., 6-45	6	3.75x5.50	33.80	364.4	L Head	Block	Poppet	Left	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand	Rayfield	Pres	Elec	Own
A. E. C., 6-60	6	4.25x5.00	43.80	425.4	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand	Rayfield	Pres	Air	
Alco, 7-16	4	3.94x4.25	24.00	207.0	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-pres	Gear	Sing	Bosch	Fixed	Stromberg	Grav		
Alco, 11-60	6	4.75x5.50	54.10	584.9	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-pres	Gear	Dual	Bosch	Hand	Newcomb	Pres		
Alpena, N-50	6	3.75x5.25	33.75	347.8	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash		Dual		Hand	Zenith	Pres	Elec	Electro
Alpena, P-40	4	3.75x5.25	22.50	272.1	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash		Dual		Hand	Zenith	Pres	Elec	Electro
American Scout, 22 A*	4	3.75x5.00	22.50	220.9	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Eisemann	Hand	Rayfield	Pres	Acet	Disco
American Tour., 34 A*	4	4.50x5.00	32.40	318.1	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Eisemann	Hand	Rayfield	Pres	Acet	Disco
American Trav., 54 A*	4	5.38x5.50	46.00	499.2	L Head	Pairs	Poppet	Right	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Rayfield	Pres	Elec	Peru
American Trav., 56 A*	4	5.38x5.50	46.00	499.2	L Head	Pairs	Poppet	Right	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Rayfield	Pres	Elec	Peru
American Road, 32 A*	4	4.50x5.00	32.40	318.1	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Eisemann	Hand	Rayfield	Pres	Acet	Disco
Ames, 44 & 45	4	4.13x5.25	27.30	280.6	L Head	Block	Poppet	Left	Gear	Pump	Tub	Spl-pres	Piston	Dual	Remy	Hand	Schebler	Grav	Acet	Disco
Apperson, 4-45	4	4.50x5.00	32.40	318.1	T Head	Sep'rt	Poppet	Head	Gear	Pump	Cell	Splash	Gear	Dual	National	Hand	Rayfield	Grav	Elec	Ward-L'd
Apperson, 4-55	4	4.75x5.00	36.10	354.4	T Head	Sep'rt	Poppet	Head	Gear	Pump	Cell	Splash	Gear	Dual	National	Hand	Rayfield	Grav	Elec	Ward-L'd
Apperson, 4-55	4	4.75x5.00	36.10	354.4	T Head	Sep'rt	Poppet	Head	Gear	Pump	Cell	Splash	Gear	Dual	National	Hand	Rayfield	Grav	Elec	Ward-L'd
Arbenz, F. G. H	4	4.13x5.50	27.30	294.0	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Spl-pres	Gear	Dual		Hand	Schebler	Grav	Elec	
[illegible] 18	4	4.50x5.50	32.40	349.9	Knight	Pairs	Sleeve	Opp	Chain	Pump	Tub	Pressure	Piston	Sing	Deaco	Hand	Stromberg	Grav	Elec	Gray & Da.
Auburn, 33L	4	3.75x5.25	22.50	231.9	L Head	Block	Poppet	Opp	Gear	Pump	Tub	Splash	Piston	Dual	Remy	Hand	Schebler	Grav		
Auburn, 37L	4	4.25x4.75	28.90	269.4	L Head	Block	Poppet	Left	Gear	Pump	Tub	Splash	Piston	Dual	Remy	Hand	Schebler	Grav		
Auburn, 40L	4	4.50x5.00	32.40	318.1	L Head	Sep'rt	Poppet	Left	Gear	Pump	Tub	Splash	Piston	Dual	Remy	Hand	Schebler	Grav		
Auburn, 6-45	6	3.75x5.25	33.75	347.8	L Head	Pairs	Poppet	Opp	Gear	Pump	Tub	Splash	Piston	Dual	Remy	Hand	Schebler	Grav		
Auburn, 6-50	6	4.13x5.25	40.80	420.9	L Head	Sep'rt	Poppet	Left	Gear	Pump	Tub	Splash	Piston	Doub	Bosch	Hand	Schebler	Grav		
Austin, 55	6	4.00x5.00	38.40	376.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Gear	Dual 2	Spld'rf	Hand	Rayfield	Grav	Air	Own
Austin, 66	6	4.50x7.00	48.60	667.9	T Head	Sep'rt	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Noncir	Dual 2	Spld'rf	Hand	Rayfield	Grav	Air	Own
Austin, 77	6	4.50x7.00	48.60	667.9	T Head	Sep'rt	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Noncir	Dual 2	Spld'rf	Hand	Rayfield	Grav	Air	Own
Bergdoll, 30	4	4.00x4.50	25.60	226.2	L Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Piston	Sing	Bosch	Hand	Schebler	Grav	Elec	U. S. L.
Bergdoll, 40	4	4.00x5.94	25.60	298.5	L Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Piston	Sing	Bosch	Hand	Schebler	Grav	Elec	U. S. L.
Bergdoll, 40	4	4.00x5.94	25.60	298.5	L Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Piston	Sing	Bosch	Hand	Schebler	Grav	Elec	U. S. L.
Buick, 25, 24	4	3.75x3.75	22.50	165.5	Straight	Pairs	Poppet	Head	Hel'l	Pump	Tub	Splash	Gear	Dual	Remy	Hand	Schebler	Grav	Acet	Disco
Buick, 31, 30	4	4.00x4.00	25.60	201.1	Straight	Pairs	Poppet	Head	Hel'l	Pump	Tub	Splash	Noncir	Dual	Remy	Hand	Schebler	Grav	Acet	Disco
Buick, 40	4	4.25x4.50	28.90	255.3	Straight	Pairs	Poppet	Head	Hel'l	Pump	Tub	Splash	Noncir	Dual	Remy	Hand	Schebler	Grav	Acet	Disco
Burg, S	6	3.75x5.25	33.75	347.8	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Spl-pres	Piston	Dual	Bosch	Hand				
Burg, R	6	4.13x5.25	40.80	420.9	L Head	Sep'rt	Poppet	Right	Gear	Pump	Cell	Spl-pres	Piston	Dual	Bosch	Hand				
Cadillac, 1913	4	4.50x5.75	32.40	365.8	L Head	Sep'rt	Poppet	Right	Chain	Pump	Tub	Splash		Doub	Delco	Hand	Own	Grav	Elec	Delco
Cameron, 29 A	4	3.88x3.75	24.00	176.9	Straight	Sep'rt	Poppet	Head	Gear	Air	....	Spl-pres	Gear	Sing		Hand	Kingston	Grav		
Cameron, 28	4	3.88x3.75	24.00	176.9	Straight	Sep'rt	Poppet	Head	Gear	Air	....	Spl-pres	Gear	Sing		Hand	Kingston	Grav		
Cameron, 30	6	3.88x3.75	36.07	265.4	Straight	Sep'rt	Poppet	Head	Gear	Air	....	Spl-pres	Gear	Sing		Hand	Kingston	Grav		
Cameron, 32	6	3.88x3.75	36.07	265.4	Straight	Sep'rt	Poppet	Head	Gear	Air	....	Spl-pres	Gear	Sing		Hand	Kingston	Grav		
Carhartt, K	4	4.07x4.50	26.40	285.0	L Head	Block	Poppet	Right	Gear	Pump	Cell	Splash		Doub		Hand	Stromberg			
Carhartt, B	4	4.50x5.50	32.40	349.9	L Head	Pairs	Poppet	.....	Gear	Pump	Cell	Splash		Dual		Hand	Stromberg	Grav		
Carroll, 4 E	4	4.50x5.50	32.40	349.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash		Doub	Optional	Hand	Rayfield	Pres	Mech	National
Carroll, 4 D	4	5.00x5.00	40.00	392.7	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Doub	Optional	Hand	Rayfield	Pres	Mech	National
Carroll, 6 C	6	4.13x5.25	40.90	420.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash		Doub	Optional	Hand	Rayfield	Pres	Mech	National
Cartercar, 5	4	4.13x4.75	27.25	253.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-pres	Noncir	Dual		Hand	Schebler	Grav	Elec	Jesco
Case, N	4	4.13x5.25	27.25	420.9	L Head	Block	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Opt	Remy	Hand	Rayfield	Pres		
Case, O	4	4.50x5.25	32.40	334.0	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Opt	Optional	Hand	Rayfield	Pres	Elec	Westing'se
Chadwick, 19—Road	6	5.00x6.00	60.00	706.8	L Head	Pairs	Poppet	L&H.	Gear	Pump	Cell	Pressure	Noncir	Doub	Bosch	Hand	Own	Pres	Opt	Optional
Chadwick, 19—Touring	6	5.00x6.00	60.00	706.8	L Head	Pairs	Poppet	L&H.	Gear	Pump	Cell	Pressure	Noncir	Doub	Bosch	Hand	Own	Pres	Opt	Optional
Chalmers, 17	4	4.25x5.25	28.90	297.8	Straight	Block	Poppet	L&H.	Gear	Pump	Cell	Splash	Gear	Dual	Spld'rf	Hand	Rayfield	Pres	Air	Own
Chalmers, 18	6	4.25x5.25	43.80	446.7	Straight	Threes	Poppet	L&H.	Gear	Pump	Cell	Splash	Gear	Dual	Spld'rf	Hand	Rayfield	Pres	Air	Own
Chevrolet, C	6	3.55x5.00	30.20	298.9	T Head	Threes	Poppet	Opp	Gear	Pump	....	Splash	Noncir	Dual		Hand		Grav	Air	English
Cino, 450	4	4.50x6.00	32.40	381.7	T Head	Block	Poppet	Opp	.....	Pump	Tub	Spl-Pres	Gear	Dual	Optional	Hand	Rayfield	Grav		
Cino, 440	4	4.50x5.00	32.40	318.1	T Head	Block	Poppet	Opp	Hel'l	Pump	Tub	Spl-Pres	Gear	Dual	Optional	Hand	Rayfield	Grav		
Cino, 660	6	4.00x6.00	38.40	452.4	T Head	Block	Poppet	Opp	Gear	Pump	Tub	Spl-Pres	Gear	Dual	Optional	Hand	Rayfield	Grav	Elec	Electro

*Underslung Frame. †Has six wheels.

ABBREVIATIONS:—Model: Tour, touring; Road, roadster. **Cylinders:** Sep'rt, separate. **Valve Location:** Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. **Camshaft Drive:** Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. **Cooling Circulation:** Thermo, thermo-syphon. **Radiator:** Cell, cellular; Tub, tubular. **Lubrication:** Spl-Pres, combined splash and pressure system in circulating unless called Noncir. **Ignition:** Sing single; Doub, double; Dual 2, double distributer; Gov, governor; Atw Kent, Atwater Kent. **Fuel Feed:** Grav, gravity; Pres, pressure. **Engine Starter:** Spr, spring; Elec, electric; Acet, acetlyene; Mech, mechanical; Opt, optional; Air, compressed air. **Bore and Stroke:** In decimals to nearest 1-100 inch, as 4.25=$4\frac{1}{4}$, etc., .06=$\frac{1}{16}$, .19=$\frac{3}{16}$, .13=$\frac{1}{8}$, .25=$\frac{1}{4}$, .31$\frac{5}{16}$=, .38=$\frac{3}{8}$, .44=$\frac{7}{16}$, .5=$\frac{1}{2}$, .56=$\frac{9}{16}$, .63=$\frac{5}{8}$, .69=$\frac{11}{16}$, .75=$\frac{3}{4}$, .81=$\frac{13}{16}$, .88=$\frac{7}{8}$.

Horsepower and Mechanical Details

In Calculating the Horsepower of the Motors Given in the Table the S. A. E. Formula Was Followed—That Is, Horsepower Equals Cylinder Bore Squared, Multiplied by the Number of Cylinders Divided by 2.5.

TRANSMISSION								RUNNING GEAR								CONTROL			BEARINGS				1
Clutch Type	GEARSET Type	GEARSET Location	GEARSET Forward Speeds	Drive	Car Drives Through	Rear Axle	Total Gear Ratio on High	Wheelbase	TIRES Front	TIRES Rear	WHEELS Kind	WHEELS Attachment	SPRINGS Front	SPRINGS Rear	Front Axle	Location Steering Wheel	Gearshift Location	Emergency Brake Control	Crankshaft Type and No.	Gearset	Rear Axle	Front Wheel	Chassis Weight, Lbs.
Disk	Sel	Unit M	3	Bevel	Rad. Rd	Float	3.50-1	116	34x4	34x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	2.250
Disk	Sel	Unit M	3	Bevel	Rad. Rd	Float	3.50-1	121	36x4½	36x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	2,850
Cone	Sel	Amid	3	Chain	Rad. Rd	Semi F	....	120	36x4½	36x4½	Wood	....	½ Ell	½ Ell	Square	Right	Right	Right	Plain, 2	Ball	Roll	Roll	....
Disk	Sel	Unit M	3	Bevel	Rad. Rd	Float	3.50-1	130	36x4½	36x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 4	Ball	Roll	Roll	2,000
Disk	Sel	Amid	4	Bevel	Rad. Rd	Float	2.63-1	138	37x5	37x5	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 4	Ball	Roll	Roll	2,500
Disk	Sel	Amid	3	Bevel	Rad. Rd	Float	3.80-1	104	32x4	32x4	Wood	....	½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,420
Disk	Sel	Amid	4	Bevel	Rad Rd	Float	3.61.1	133½	36x4½	37x5	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 5	Ball	Ball	Ball	3,560
Disk	Sel	....	......	Bevel	Springs	Float	3.50-1	135	36x4	36x4	......	....	......	......	I-Beam	Opt	Cent	Cent	Plain, 4	Plain	Ball	Ball	....
Disk	Sel	....	......	Bevel	Springs	Float	3.50-1	135	36x4	36x4	......	....	......	......	I-Beam	Opt	Cent	Cent	Plain, 4	Plain	Ball	Ball	....
Cone	Sel	Amid	3	Bevel	Tor T	Eloat	4.07-1	105	36x3½	36x3½	Wood	....	½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,000
Cone	Sel	Amid	3	Bevel	Tor T	Float	3.20-1	118	37x4	37x4	Wood	....	½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,150
Cone	Sel	Amid	4	Bevel	Tor T	Float	4.02-1	124	40x4	41x4½	Wood	....	½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	3,000
Cone	Sel	Amid	4	Bevel	Tor T	Float	4.29-1	140	41x4½	41x4½	Wood	....	½ Ell	½ Ell	I Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	3,100
Cone	Sel	Amid	3	Bevel	Tor T	Float	3.20-1	118	37x4	37x4	Wood	....	½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,150
Disk	Sel	Uint M	3	Bevel	Springs	Float	3.50-1	118	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Roll	Ball	Ball	2,100
Con Bd	Sel	Amid	3	Bevel	Tor T	Semi F	3.50-1	114	34x4	34x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 5	Ball	B&R	Ball	2,300
Con Bd	Sel	Amid	3	Bevel	Tor T	Semi F	3.50-1	118	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 5	Ball	B&R	Ball	2,800
Con Bd	Sel	Amid	3	Bevel	Tor T	Semi F	3.50-1	122	36x4½	36x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 5	Ball	B&R	Ball	3,000
Cone	Sel	Unit X	3	Bevel	Rad Rd	Float	....	120	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Ball	Roll	2,900
Disk	Sel	Unit X	3	Worm	Tor T	Float	3.85-1	130	37x5	37x5	Wood	....	½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 5	Ball	Ball	Roll	3,000
Cone	Sel	Amid	3	Bevel	Rad Rd	Semi F	3.50-1	112	34x3½	34x3½	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Roll	2,500
Disk	Sel	Unit M	3	Bevel	Rad Rd	Float	3.50-1	115	35x4	35x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,850
Cone	Sel	Amid	3	Bevel	Rad Rd	Float	3.50-1	122	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 5	Ball	Ball	Ball	2,950
Cone	Sel	Amid	3	Bevel	Rad Rd	Float	3.50-1	130	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 4	Ball	Ball	Ball	3,100
Disk	Sel	Amid	3	Bevel	Rad Rd	Float	3.50-1	135	37x4½	37x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 7	Ball	Ball	Ball	3,450
Disk	Sel	Amid	4	Bevel	Springs	Float	....	141	37x5	37x5	Wood	....	½ Ell	¾ Ell	I-Beam	Left	Cent	Pedal	Plain, 4	Ball	Ball	Ball	....
Disk	Sel	Amid	4	Bevel	Springs	Float	....	141	37x5	37x5	Wood	....	½ Ell	¾ Ell	I-Beam	Left	Cent	Pedal	Plain, 7	Ball	Ball	Ball	....
Disk	Sel	Amid	4	Bevel	Springs	Float	....	141	37x5	37x5	Wood	....	½ Ell	¾ Ell	I-Beam	Left	Cent	Pedal	Plain, 7	Ball	Ball	Ball	....
Disk	Sel	Unit M	3	Bevel	Springs	Float	3.75-1	115	34x4	34x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Ball, 2	Ball	Ball	Ball	2,500
Disk	Sel	Unit M	4	Bevel	Springs	Float	2.80-1	121	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Ball, 2	Ball	Ball	Ball	2,600
Disk	Sel	Unit M	4	Bevel	Springs	Float	2.80-1	115	34x4	34x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Ball, 2	Ball	Ball	Ball	2,500
Cone	Sel	Amid	3	Bevel	Rad Rd	Semi F	4.00-1	105	32x3½	32x3½	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	B&R	Ball	2,000
Cone	Sel	Unit M	3	Bevel	Tor T	Semi F	4.00-1	108	34x4	34x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	B&R	Ball	2,600
Cone	Sel	Unit M	3	Bevel	Tor T	Float	3.75-1	115	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	B&P	Ball	Ball	2,870
Disk	Sel	Unit M	3	Bevel	S & T T	....	....	124	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Opt	Cent	Pedal	Plain, 5	Ball	Ball	Ball	2,000
Disk	Sel	Unit M	3	Bevel	S & T T	Float	4.00-1	134	36x4½	36x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 7	Ball	Ball	Ball	2,700
Cone	Sel	Amid	3	Bevel	S& T T	Float	3.50-1	120	36x4½	36x4½	Wood	....	½ Ell	¾ Plat	I-Beam	Right	Right	Right	Plain, 5	Ball	Roll	Roll	....
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.00-1	110	32x3½	32x3½	Wood	....	½ Ell	Ell	Tube	Right	Right	Cent	Plain, 3	Plain	Ball	Ball	1,700
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.00-1	104	32x3	32x3	Wood	....	½ Ell	Ell	Tube	Right	Right	Right	Plain, 3	Plain	Ball	Ball	1,485
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.00-1	114	34x3½	34x3½	Wood	....	½ Ell	Ell	Tube	Right	Right	Right	Plain, 3	Plain	Ball	Ball	1,600
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.00-1	120	34x3½	34x3½	Wood	....	½ Ell	Ell	Tube	Right	Cent	Cent	Plain, 3	Plain	Ball	Ball	1,800
Cone	Sel	Amid	3	Bevel	Tor T	Float	3.50-1	109	34x4	34x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	......	Roll	Ball	2,350
Cone	Sel	Amid	3	Bevel	Tor T	Float	3.50-1	119	34x4	34x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	......	Roll	Roll	2,950
Disk	Sel	Amid	4	Bevel	R & T R	Float	....	118	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Opt	Right	Right	Plain, 3	Ball	Roll	Roll	2,850
Disk	Sel	Amid	4	Bevel	R & T R	Float	....	128	36x4½	36x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Opt	Right	Right	Plain, 3	Ball	Roll	Roll	3,500
Disk	Sel	Amid	4	Bevel	R & T R	Float	....	128	36x4½	36x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Opt	Right	Right	Plain, 5	Ball	Roll	Roll	3,750
....	Frict	....	......	Chain	Rad Rd	Float	....	116	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Plain	Ball	Ball	2,350
Disk	Sel	Unit M	3	Bevel	Springs	Float	3.50-1	115	34x4	34x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Plain	Ball	Ball	....
Disk	Sel	Amid	3	Bevel	Springs	Float	3.50-1	125	37x4½	37x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	3,500
Exp Bd	Sel	Amid	4	Chain	Rad Rd	Dead	2.00-1	112	36x4½	36x4½	Wood	....	½ Ell	Plat	I-Beam	Right	Right	Right	Plain, 4	Ball	Ball	Ball	2,700
Exp Bd	Sel	Amid	4	Chain	Rad Rd	Dead	2.25-1	133	36x4½	37x5	Wood	....	½ Ell	Plat	I-Beam	Right	Right	Right	Plain, 4	Ball	Ball	Ball	3,000
Disk	Sel	Unit M	4	Bevel	Tor R	Float	3.75-1	118	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Ball, 2	Roll	Roll	Roll	2,774
Disk	Sel	Unit M	4	Bevel	Tor R	Float	3.75-1	130	36x4½	36x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Ball, 3	Roll	Roll	Roll	3,173
Cone	Sel	Unit X	3	Bevel	Tor T	Float	....	120	35x4½	35x4½	Wood	....	½ Ell	¾ Plat	I-Beam	Left	Cent	Right	Plain, 3	Plain	Roll	Ball	....
Cone	Sel	....	3	Bevel	....	Float	....	120	34x4	34x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Ball	Ball	Roll	....
Cone	Sel	Unit X	3	Bevel	....	Float	3.50-1	120	34x4	34x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Ball	Ball	Roll	2,422
Cone	Sel	....	3	Bevel	S & T T	Float	3.75-1	132	36x4½	36x4½	Opt	....	½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Ball	Ball	Roll	3,560

ABBREVIATIONS:—Clutch Type: Exp Bd, expanding band; Con Bd, contracting band. **Gearset:** Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; Unit M, unit with motor; Unit X, unit with rear axle; Amid, amidships. **Drive:** Bevel, shaft with bevel gear at rear axle; Worm, shaft with worm gear at rear axle. **Car Drives through:** Tor T, torsion tube; S & T T, springs and torsion tube; R & T R, radius rods and torsion rod; Rad Rd, radius rods; S & R R, springs and radius rods; Tor Rd, torsion rod. **Rear Axle:** Float, floating; Semi-F, semi-floating; ¾ Float, ¾ floating. **Wheel Attachment:** Dem, demountable. **Springs:** ½ Ell, semi-elliptic; Ell, elliptic; ¾-Ell, ¾ elliptic; Plat, platform. **Front Axle:** Tub, tubular. **Control Location Steering:** Cent, center. **Bearings:** Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller; B R & P, ball, roller and plain.

Passenger Car Chassis Listed for 1913

2					CYLINDERS		VALVES			COOLING		LUBRICATION		IGNITION			CARBURETION		ENGINE STARTER	
NAME AND MODEL	No. of Cylinders	Bore and Stroke, Inches	S. A. E. H. P.	Piston Displacement Cubic Inches	Shape	How Cast	Type	Location	Camshaft Drive	Circulation	Radiator	System	Type of Pump	System	Magneto Generator	Control	Make of Carbureter	Fuel Feed	Type	Make
Coey	6	4.00x5.00	38.40	376.9	T Head	Threes	Poppet	Opp	Gear	Pump	Cell	Splash		Dual		Hand	Schebler	Pres		
Colby, C	4	4.13x5.25	27.25	280.6	L Head	Block	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Piston	Dual	Eisemann	Hand	Rayfield	Grav	Air	Thurber
Colby, E	4	4.50x5.50	32.40	349.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Piston	Dual	Eisemann	Hand	Rayfield	Pres	Air	Thurber
Colby, C-6-60	6	4.13x5.25	40.88	420.9	L Head	Threes	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Piston	Doub	Eisemann	Hand	Rayfield	Pres	Elec	Gray & Da.
Cole, 40	4	4.13x4.75	27.25	253.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Dual	Delco	Hand	Schebler	Pres	Elec	Delco
Cole, 50	4	4.50x5.25	32.40	334.0	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Dual	Delco	Hand	Schebler	Pres	Elec	Delco
Cole, 60	6	4.13x4.75	40.90	380.8	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Dual	Delco	Hand	Schebler	Pres	Elec	Delco
Columbia, Mark 88	4	4.88x5.13	38.00	382.6	Knight	Pairs	Sleeve	Opp	Chain	Pump	Cell	Splash	Piston	Doub	Bosch	Hand	Stromberg	Pres		
Columbia, Mark 85	4	4.88x5.13	38.00	410.6	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Doub	Bosch	Hand	Stromberg	Pres		
Corbitt, D, E, & F	4	4.00x4.50	25.60	226.2	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Pressure	Gear	Sing	U. & H	Hand	Stromberg	Grav	Elec	Northeast
Correja, T & D	4	4.25x5.00	28.90	283.6	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Doub	Simms	Hand	Schebler	Pres	Mech	Volkmer
Correja, A, B & C	4	4.25x5.00	28.90	283.6	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Sing	Simms	Fixed	Schebler	Grav		
Correja, S & R	6	4.25x5.00	43.35	425.4	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Doub	Simms	Hand	Schebler	Pres	Mech	Volkmer
Correja, C & J	†6	3.50x5.00	29.40	388.6	T Head	Threes	Poppet	Opp	Chain	Thermo	Tub	Spl-Pres	Gear	Doub	Eisemann	Hand		Pres	Elec	
Correja, R & S	6	4.00x6.00	38.40	452.4	T Head	Threes	Poppet	Opp	Gear	Pump	Tub	Spl-Pres	Gear	Doub	Eisemann	Hand		Pres		
Crane, 3	6	4.38x6.25	46.90	563.7	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand		Pres	Air	Own
Crawford, 13-30	4	4.13x5.25	27.25	280.6	L Head	Block	Poppet	Left	Spi'l	Pump	Tub	Spl-Pres	Piston	Dual	Remy	Hand	Stromberg	Grav	Elec	Gray & Da.
Crawford, 13-40	4	4.50x5.50	32.40	349.9	L Head	Pairs	Poppet	Left	Spi'l	Pump	Tub	Spl-Pres	Gear	Dual	Bosch	Hand	Stromberg	Grav	Elec	Gray & Da.
Crow Elkhart, C-1	4	3.75x4.50	22.50	198.8	L Head	Block	Poppet	Right	Gear	Thermo	Cell	Splash	Piston	Dual	Briggs	Hand	Schebler	Grav	Acet	Prestolite
Crow-Elkhart, C-2-3-4, D-T	4	4.00x4.50	25.60	226.2	L Head	Block	Poppet	Right	Gear	Thermo	Cell	Splash	Piston	Dual	Briggs	Hand	Schebler	Grav	Acet	Prestolite
Crow Elkhart, C-5	4	4.13x5.00	27.25	267.3	T Head	Block	Poppet	Opp	Gear	Thermo	Cell	Splash	Piston	Dual	Briggs	Hand	Schebler	Grav		
Crow Elkhart, C-7-8-9	4	4.50x5.00	32.40	318.1	L Head	Pairs	Poppet	Left	Gear	Thermo	Cell	Splash	Gear	Dual	Briggs	Hand	Schebler	Grav	Acet	Prestolite
Crow Elkhart, C-6A	6	4.13x5.25	40.90	420.9	L Head	Pairs	Poppet	Left	Gear	Thermo	Cell	Splash		Dual	Briggs	Hand	Schebler	Grav	Acet	Prestolite
Crow Elkhart, C-6-B	6	3.75x5.00	33.75	331.4	L Head	Pairs	Poppet	Left	Gear	Thermo	Cell	Spl-Pres	Piston	Dual	Briggs	Hand	Stromberg	Grav	Elec	
Croxton, A	4	4.13x5.50	27.30	294.0	L Head	Block	Poppet	Right	Gear	Thermo	Cell	Splash		Sing	Eisemann	Fixed	Schebler	Grav	Elec	Northeast
Croxton, B6	6	4.25x5.50	43.80	468.0	L Head	Threes	Poppet	Right	Gear	Thermo	Cell	Splash		Sing	Eisemann	Fixed	Schebler	Grav	Elec	Northeast
Cunningham, M	4	4.75x5.75	36.10	407.6	Straight	Pairs	Poppet	Head	Gear	Pump	Cell	Pressure	Gear	Dual		Hand		Pres	Elec	
Cutting, 40	4	4.00x5.00	25.60	251.3	L Head	Block	Poppet	Left	Gear	Pump	Cell	Pressure	Gear	Dual	Remy	Hand	Rayfield	Grav	Acet	Hanna
Davis, 40	4	4.13x5.25	27.25	280.6	L Head	Block	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Dual		Hand	Stromberg	Grav	Opt	Optional
Davis, 50	4	4.50x5.50	32.40	349.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Dual		Hand	Stromberg	Grav	Opt	Optional
Day, Utility, D	4	4.00x4.50	25.60	267.3	L Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Splash		Doub	Remy	Hand	Schebler	Grav		
Detroiter, A	4	3.38x4.75	18.25	170.0	L Head	Block	Poppet	Left	Gear	Thermo	Tub	Splash	Gear	Sing	Bosch	Fixed	Kingston	Grav		
Diamond, T F	4	5.00x5.50	40.00	431.4	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Splash	Piston	Dual	Bosch	Hand	Rayfield	Pres		
Dispatch, G-2	4	3.50x.500		192.4	2 Cycle	Sep'rt				Air		Splash		Dual	Optional	Hand	Maco	Grav		
Dorris, H	4	4.38x5.00	30.73	300.7	Straight	Pairs	Poppet	Head	Gear	Pump	Tub	Splash	Gear	Sing	Bosch	Hand	Stromberg	Pres	Elec	Apple Co.
Duquesne, 50	4	4.75x5.50	36.10	389.9	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Mea	Hand		Pres	Elec	
Duquesne, Six	6	3.75x5.50	33.75	364.4	L Head	Block	Poppet	Left	Gear	Pump	Cell	Pressure	Gear	Dual	Mea	Hand		Pres	Elec	
Duryea, Victoria	2	3.75x3.75		82.8	2 Cycle	Sep'rt				Air		In fuel		Sing	Dry Cells	Hand	Heitger	Grav	Lever	Own
Duryea, Runabout	2	3.75x3.75		82.8	2 Cycle	Sep'rt				Air		In fuel		Sing	Dry Cells	Hand	Heitger	Grav	Lever	Own
Duryea, Buggy	2	3.75x3.75		82.8	2 Cycle	Sep'rt				Air		In fuel		Sing	Dry Cells	Hand	Heitger	Grav	Lever	Own
Duryea, Surry	2	3.75x3.75		82.8	2 Cycle	Sep'rt				Air		In fuel		Sing	Dry Cells	Hand	Heitger	Grav	Lever	Own
Edwards, 25	4	4.00x5.50	25.60	276.5	Knight	Pairs	Sleeve		Chain	Pump	Cell	Pressure	Piston		Simms	Hand	S.U	Pres	Elec	W. S. L.
Empire, Touring	4	3.50x4.50	19.60	173.2	L Head	Pairs	Poppet	Left	Gear	Thermo	Tub	Spl-Pres	Piston	Sing	Eisemann	Fixed	Holley	Grav		
Enger, F, J. E	4	4.50x5.25	32.40	334.0	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Flywheel	Dual	Remy	Hand	Schebler	Grav		
Enger, P	4	4.50x5.25	32.40	334.0	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Flywheel	Dual	Remy	Hand	Schebler	Grav	Elec	Northeast
Falcar, 40	4	4.13x5.25	27.25	280.6	L Head	Sep'rt	Poppet	Right	Gear	Pump	Tub	Spl-Pres		Dual	Bosch	Hand	Rayfield	Grav		
Fiat, 54	4	4.40x6.00	30.63	371.2	L Head	Block	Poppet	Left	Gear	Pump	Tub	Spl-Pres	Gear	Dual	Bosch	Hand	Own	Pres		
Fiat, 56	6	4.40x6.00	45.95	556.8	L Head	Block	Poppet	Left	Gear	Pump	Tub	Spl-Pres	Gear	Dual	Bosch	Hand	Own	Pres		
Fiat, 55	4	5.13x6.75	42.00	557.0	L Head	Block	Poppet	Left	Gear	Pump	Tub	Spl-Pres	Gear	Dual	Bosch	Hand	Own	Pres		
Firestone-Col., 86E	4	4.13x5.25	27.25	280.6	L Head	Block	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Splt'rf	Hand	Schebler	Grav	Elec	Northeast
Firestone-Col., 60	4	4.50x5.50	32.40	349.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Doub	Conn.	Hand	Schebler	Grav	Elec	Northeast
Firestone-Col., 90	6	4.13x5.25	40.90	420.9	L Head	Threes	Poppet	Right	Gear	Pump	Cell	Splash	Piston	Doub	Conn.	Hand		Pres	Elec	Northeast
Flanders, 40	6	3.63x4.50	31.60	278.7	L Head	Block	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Splt'rf	Hand	Holley	Pres	Elec	Gray & Da.
Flanders, 50	6	4.00x4.75	38.40	358.2	L Head	Block	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Splt'rf	Hand	Holley	Pres	Elec	Gray & Da.
Ford, T	4	3.75x4.00	22.50	176.7	L Head	Block	Poppet	Right	Gear	Thermo	Tub	Splash	Flywheel	Sing	Own	Hand	Holley	Grav		
Franklin, G Run	4	4.00x4.00	25.60	201.1	Straight	Sep'rt	Poppet	Head	Gear	Air		Pressure	Gear	Dual	Bosch	Gov	Own	Grav		
Franklin, G Tour	4	4.00x4.00	25.60	201.1	Straight	Sep'rt	Poppet	Head	Gear	Air		Pressure	Gear	Dual	Bosch	Gov	Own	Grav		
Franklin, M	6	3.63x4.00	31.60	247.7	Straight	Sep'rt	Poppet	Head	Gear	Air		Pressure	Gear	Dual	Bosch	Gov	Own	Grav	Elec	Entz
Franklin, D	6	4.00x4.00	38.40	301.7	Straight	Sep'rt	Poppet	Head	Gear	Air		Pressure	Gear	Dual	Bosch	Gov	Own	Grav	Elec	Entz
Franklin H	6	4.00x4.00	38.40	301 7	Straight	Sep'rt	Poppet	Head	Gear	Air		Pressure	Gear	Dual	Bosch	Gov	Own	Grav	Elec	Entz
Garford, 14	6	4.25x5.25	43.50	456.7	L Head	Threes	Poppet	Left	Spir'l	Pump	Cell	Spl-Pres	Gear	Dual	Bosch	Hand				
Garford, G15	6	3.75x6.00	33.75	497.5	L Head	Block	Poppet	Right	Gear	Pump	Cell	Spl-Pres	Gear	Sing	Bosch	Hand	Own	Pres	Elec	U. S. L.
Gleason, R	2	4.75x4.00	18.00	141.8	L Head	Sep'rt	Poppet	Side	Gear	Thermo	Tub	Spl-Pres	Noncir	Dual	Remy	Hand	Schebler	Grav		
Glide, 36-42	4	4.13x5.25	27.25	280.6	L Head	Block	Poppet	Left	Gear	Pump	Tub	Splash	Gear	Dual	Remy	Hand	Stromberg	Grav	Acet	Disco.
Glide, 45	4	4.75x5.00	36.10	354.4	L Head	Sep'rt	Poppet	Left	Gear	Pump	Tub	Splash.	Gear	Dual	Eisemann	Hand	Schebler	Grav	Acet	Disco
Great Eagle, B	4	4.75x5.00	36.10	354.4	L Head	Sep'rt	Poppet	S&H	Gear	Pump	Cell			Dual	Remy	Hand	Stromberg	Grav		

*Underslung Frame. †Has six wheels.

ABBREVIATIONS:—Model: Tour, touring; Road, roadster. **Cylinders:** Sep'rt, separate. **Valve Location:** Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. **Camshaft Drive:** Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. **Cooling Circulation:** Thermo, thermo-syphon. **Radiator:** Cell, cellular; Tub, tubular. **Lubrication:** Spl-Pres, combined splash and pressure system in circulating unless called Noncir. **Ignition:** Sing, single; Doub, double; Dual 2, double distributer; Gov, governor; Atw Kent, Atwater Kent. **Fuel Feed:** Grav, gravity; Pres, pressure. **Engine Starter:** Spr, spring; Elec, electric; Acet, acetlyene; Mech, mechanical; Opt, optional; Air, compressed air. **Bore and Stroke:** In decimals to nearest 1-100 inch, as 4.25=$4\frac{1}{4}$, etc., .06=$\frac{1}{16}$, .19=$\frac{3}{16}$, .13=$\frac{1}{8}$, .25=$\frac{1}{4}$, .31=$\frac{5}{16}$, .38=$\frac{3}{8}$, .44=$\frac{7}{16}$, .5=$\frac{1}{2}$, .56=$\frac{9}{16}$, .63=$\frac{5}{8}$, .69=$\frac{11}{16}$, .75=$\frac{3}{4}$, .81=$\frac{13}{16}$, .88=$\frac{7}{8}$.

Horsepower and Mechanical Details

TRANSMISSION								RUNNING GEAR								CONTROL			BEARINGS				2
Clutch Type	GEARSET Type	GEARSET Location	GEARSET Forward Speeds	Drive	Car Drives Through	Rear Axle	Total Gear Ratio on High	Wheelbase	TIRES Front	TIRES Rear	WHEELS Kind	WHEELS Attachment	SPRINGS Front	SPRINGS Rear	Front Axle	Location Steering Wheel	Gearshift Location	Emergency Brake Control	Crank-shaft Type and No.	Gearset	Rear Axle	Front Wheel	Chassis Weight, Lbs.
Disk	Sel	Unit X	3	Bevel	Tor T	Float		128	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Opt	Cent	Cent	Plain, 3	Plain	Roll	Ball	2,100
Disk	Sel	Unit M	3	Bevel	Tor Rd	Float	Opt	118	34x4½	34x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Roll	Roll	Roll	2,800
Disk	Sel	Unit M	3	Bevel	Tor Rd	Float	Opt	128	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Roll	Roll	Roll	32,00
Disk	Sel	Unit M	3	Bevel	Tor Rd	Float	Opt	138	37x5	37x5	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Roll	Roll	Roll	34.00
Cone	Sel	Unit M	3	Bevel	Tor Rd	Float		116	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Roll	Roll	
Cone	Sel	Unit M	3	Bevel	Tor Rd	Float		122	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Roll	Roll	
Cone	Sel	Unit M	3	Bevel	Tor Rd	Float		132	37x4½	37x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Roll	Roll	
Cone	Sel	Amid	4	Bevel	Rad Rd	Float	3.75-1	129	36x4½	36x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Cent	Cent	Plain, 5	Ball	Roll	Roll	3,800
Cone	Sel	Amid	3	Bevel	Springs	Float	3.38-1	120	36x4½	36x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Roll	Roll	3,700
Disk	Sel	Unit M	3	Bevel	Springs	Float	3.85-1	120	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Ball	Ball	Ball	2,200
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.50-1	125	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	2,400
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.00-1	105	34x3½	34x3½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	2,100
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.00-1	125	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 4	Roll	Roll	Roll	2,600
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.00-1	125	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Roll	Roll	Ball	
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.50-1	125	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 7	Roll	Roll	Ball	
Disk	Sel	Amid	4	Bevel	Rad Rd	Float	3.00-1	135	36x4½	37x5	Wood		½ Ell	Plat		Right	Right	Right	Plain, 7	Ball	Ball	Ball	3,100
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.50-1	115	34x4	34x4	Wood		½ Ell	Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	2,600
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.50-1	125	36x4	36x4	Wood		½ Ell	Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	2,800
Disk	Sel	Unit M	3	Bevel	Rad Rd	Semi F		112	32x3½	32x3½	Wood		½ Ell	Ell	I-Beam	Right	Cent	Cent	Plain, 2	Roll	Roll	Ball	
Disk	Sel	Unit M	3	Bevel	Rad Rd	¾Float		114	34x3½	34x3½	Wood		½ Ell	Ell	I-Beam	Right	Cent	Cent	Plain, 2	Roll	Roll	Ball	
Disk	Sel	Unit M	3	Bevel	Rad Rd	¾Float		122	35x4	35x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 2	Roll	Roll	Ball	
Disk	Sel	Unit M	3	Bevel	Rad Rd	Float		122	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Roll	Ball	Ball	
Disk	Sel	Unit M	3	Bevel	S & R R	Float		137	37x4½	37x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 4	Roll	Ball	Ball	
Disk	Sel	Unit M	3	Bevel	Rad Rd	Float	4.00-1	122	35x4½	35x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 4	Ball	Roll	Ball	
Disk	Sel	Amid	3	Bevel	Rad Rd	Float	4.00-1	121	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Plain	Ball	Roll	2,350
Disk	Sel	Amid	4	Bevel	Rad Rd	Float	4.50-1	138	36x4½	36x4½	Wood		½ Ell	¾ Plat	I-Beam	Left	Cent	Cent	Plain, 3	Plain	Ball	Roll	2,750
Cone	Sel	Unit M	3	Bevel	Springs	Float	3.43-1	124	36x4½	36x4½	Wood		½ Ell	½ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Roll	Roll	
Disk	Sel	Unit M	3	Bevel	Tor T	Semi F		120	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Roll	Ball	2,200
Cone	Sel		3	Bevel	Rad Rd	Float	3.50-1	118	36x4	36x4	Wood		½ Ell	¾ Plat	I-Beam	Right	Cent	Cent	Plain, 3	Ball	Ball	Ball	
Cone	Sel		3	Bevel	Rad Rd	Float	3.50-1	118	36x4	36x4	Wood		½ Ell	¾ Plat	I-Beam	Right	Cent	Cent	Plain, 3	Ball	B&R	Ball	
Disk	Pro		3	Bevel	Springs	Float		115	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Roll	Ball	
Disk	Sel	Unit M	3	Bevel	Tor T	Float	4.00-1	104	32x3½	32x3½	Wood		½ Ell	Plat	I-Beam	Left	Cent	Pedal	Ball, 2	Ball	Ball	Roll	2,000
Disk	Sel	Amid	3	Bevel	Tor R	Float		126	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	3,300
	Frict	Amid		Chain	S&RR	Dead	6.25-1	120	36x3½	36x3½	Wood		Ell	Ell	Tube	Right	Pedal	Right	Plain, 5	Roll	Roll	Roll	1,200
Disk	Sel	Unit M	3	Bevel	Springs	Float	3.66-1	121	36x4	36x4	Wood		½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	
Disk	Sel	Unit M	3	Bevel	Springs	Float		124	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Roll	Roll	2,600
Disk	Sel	Unit M	3	Bevel	Springs	Float		133	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 4	Ball	Roll	Roll	2,700
	Frict	Unit X	2	Roller	Tor T	Dead		100	30x3	36x3	Wood		½ Ell	½ Ell	Tube	Cent	Cent		Plain, 4	Roll	Ball	Ball	650
	Frict	Unit X	2	Roller	Tor T	Dead		80	30x3	36x3	Wood		½ Ell	½ Ell	Tube	Cent	Cent		Plain, 4	Roll	Ball	Ball	650
	Frict	Unit X	2	Roller	Tor T	Dead		80	1¾	1¾	Wood		½ Ell	½ Ell	Tube	Cent	Cent		Plain, 4	Roll	Ball	Ball	650
	Frict	Unit X	2	Roller	Tor T	Dead		90	1½	1½	Wood		½ Ell	½ Ell	Tube	Cent	Cent		Plain, 4	Roll	Ball	Ball	650
Disk	Sel	Amid	4	Bevel	Rad Rd	Float	3.00-1	120	36x4½	36x4½	Wire	Dem	½ Ell	½ Ell	I-Beam	Left	Cent	Cent	Plain, 5	Roll	Roll	Roll	
Disk	Sel	Unit M	3	Bevel	S & T T	Semi F		104	32x3½	32x3½	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent	Pedal	Plain, 3	Ball	B&R	Ball	1,550
Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.50-1	120	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent	Pedal	Plain, 3	Ball	Ball	Ball	2,400
Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.50-1	120	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent	Pedal	Plain, 3	Ball	Ball	Ball	
Cone	Sel	Amid	3	Bevel	S & R R	Float	3.50-1	116	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,400
Disk	Sel	Amid	4	Bevel	Springs	Semi F	3.33-1	123	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,800
Disk	Sel	Amid	4	Bevel	Springs	Semi F	3.50-1	135	36x4½	37x5	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 4	Ball	Ball	Ball	3,300
Disk	Sel	Amid	4	Bevel	Springs	Semi F	3.00-1	128	36x4½	37x5	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	3,150
Cone	Sel	Amid	3	Bevel	Springs	Float		116	34x4	34x4	Opt		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Ball	Ball	
Cone	Sel	Amid	3	Bevel	Springs	Float		122	36x4	36x4	Opt		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Ball	Ball	
Disk	Sel	Unit M	3	Bevel	Springs	Float		130	36x4½	36x4½	Opt		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Ball	Ball	
Cone	Sel	Unit X	3	Bevel	Tor T	¾Float	3.50-1	118	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	P&R	Roll	Ball	2,600
Cone	Sel	Unit X	3	Bevel	Tor T	¾ Float	3.75-1	130	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	P&R	Roll	Roll	3,750
Disk	Plan	Unit M	2	Bevel	Tor T	Semi F	3.64-1	100	30x3	30x3½	Wood		Cross	Cross	I-Beam	Left	Pedal	Left	Plain, 3		Roll	Ball	1,000
Disk	Sel	Amid	3	Bevel	Springs	Semi F		100	32x3½	32x3½	Wood		Ell	Ell	Tube	Right	Right	Right	Plain, 5	Ball	B&R	Roll	1,800
Disk	Sel	Amid	3	Bevel	Springs	Semi F		103	32x4	32x4	Wood		Ell	Ell	Tube	Right	Right	Right	Plain, 5	Ball	B&R	Roll	2,300
Disk	Sel	Amid	3	Bevel	Springs	Semi F		116	34x4½	34x4½	Wood		Ell	Ell	Tube	Right	Right	Right	Plain, 7	Ball	B&R	Roll	2,400
Disk	Sel	Amid	3	Bevel	Springs	Semi F		123	36x4½	37x5	Wood		Ell	Ell	Tube	Right	Right	Right	Plain, 7	Ball	B&R	Roll	2,900
Disk	Sel	Amid	3	Bevel	Springs	Semi F		126	37x5	37x5	Wood		Ell	Ell	Tube	Right	Right	Right	Plain, 7	Ball	B&R	Roll	3,000
Cone	Sel	Amid	4	Bevel	Tor T	Float	2.73-1	139	36x4½	37x5	Wood		½ Ell	¾ Plat	I-Beam				Plain, 3	Ball	B&R	Roll	3,050
Cone	Sel	Unit M	4	Bevel	Tor T	Float		128	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 4	Ball	B&R	Roll	3,050
Disk	Sel	Unit M	3	Bevel	Tor R	Float	6.00-1	96	36x2	36x2	Wood		½ Ell	Ell	I-Beam	Right	Right	Right	Plain, 2	Plain	Roll	Ball	1,500
Disk	Sel	Unit M	3	Bevel	Springs	¾Float		118	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Roll	Ball	Ball	2,300
Disk	Sel	Unit X	3	Bevel	Tor T	Float		120	36x4½	36x4½	Wood		½ Ell	½ Ell	I-Beam	Right	Cent	Cent	Plain, 6	Roll	Roll	Roll	2,800
Cone	Sel	Amid	3	Bevel		Float		135	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right					

ABBREVIATIONS:—Clutch Type: Exp Bd, expanding band; Con Bd, contracting band. **Gearset:** Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; Unit M, unit with motor; Unit X, unit with rear axle; Amid, amidships. **Drive:** Bevel, shaft with bevel gear at rear axle; Worm, shaft with worm gear at rear axle. **Car Drives through:** Tor T, torsion tube; S & T T, springs and torsion tube; R & T R, radius rods and torsion rod. Rad Rd, radius rods; S & R R, springs and radius rods; Tor Rd, torsion rod. **Rear Axle:** Float, floating; Semi-F, semi-floating; ¾ Float, ¾ floating. **Wheel Attachment:** Dem, demountable. **Springs:** ½ Ell, semi-elliptic; Ell, elliptic; ¾-Ell, ¾ elliptic; Plat, platform. **Front Axle:** Tub, tubular. **Control Location Steering:** Cent, center. **Bearings:** Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller; B R & P, ball, roller and plain.

Passenger Car Chassis Listed for 1913

MAKE AND MODEL	No. of Cylinders	Bore and Stroke, Inches	S. A. E. H. P.	Piston Displacement Cubic Inches	CYLINDERS Shape	CYLINDERS How Cast	VALVES Type	VALVES Location	VALVES Camshaft Drive	COOLING Circulation	COOLING Radiator	LUBRICATION System	LUBRICATION Type of Pump	IGNITION System	IGNITION Magneto Generator	IGNITION Control	CARBURETION Make of Carbureter	CARBURETION Fuel Feed	ENGINE STARTER Type	ENGINE STARTER Make
Great Eagle, C	6	4.13x5.25	40.90	420.9	L Head	Sep'rt	Poppet	S&H	Gear	Pump	Cell	....	....	Dual	Remy	Hand	Rayfield	Grav	....	....
Great Southern, 30	4	4.00x4.50	25.60	226.6	L Head	Block	Poppet	Right	Gear	Thermo	Tub	Spl-Pres	Piston	Dual	Bosch	Hand	Schebler	Grav	Acet	Prestolite
Great Southern, 51	4	5.19x6.00	47.90	507.2	L Head	Pairs	Poppet	Right	Gear	Pump	Cell	Spl-Pres	Gear	Dual	Bosch	Hand	Stromberg	Grav	Opt	Optional
Great Western	4	4.25x5.50	28.90	312.0	L Head	Sep'rt	Poppet	Right	Gear	Pump	Tub	Splash	Piston	Dual	Remy	Hand	Schebler	Grav	Acet	Prestolite
Grout, 35	4	4.50x5.50	32.40	349.0	L Head	Sep'rt	Poppet	Left	Gear	Pump	Cell	Splash	....	Dual	....	Hand	Schebler	Grav	Elec	Ward-L'd
Grout, 45	4	4.75x5.00	38.00	354.4	L Head	Sep'rt	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	....	Hand	Schebler	Grav	Elec	Ward-L'd
Halladay, 32	4	3.75x5.25	22.50	231.9	L Head	Block	Poppet	Left	Gear	Pump	Tub	Splash	Piston	Dual	Briggs	Hand	Schebler	Grav	....	....
Halladay, 40	4	4.50x5.00	32.40	318.1	L Head	Sep'rt	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Doub	Bosch	Hand	Schebler	Grav	Elec	Jones
Havers, 44	6	3.75x5.00	33.75	330.4	L Head	Pairs	Poppet	Left	Gear	Thermo	Cell	Spl-Pres	Gear	Dual	....	Hand	Stromberg	Pres	Acet	Disco
Havers, 55	6	4.00x5.00	38.40	376.9	L Head	Pairs	Poppet	Left	Gear	Thermo	Cell	Spl-Pres	Gear	Sing	Atw Kent	Hand	Stromberg	Pres	Elec	Northeast
Haynes, 22	4	4.50x5.50	32.40	349.9	T Head	Pairs	Poppet	Opp	Hel'l	Pump	Cell	Spl-Pres	Piston	Dual	Eisemann	Hand	Stromberg	Grav	Elec	Own
Henderson	4	4.13x5.25	27.25	220.9	L Head	Block	Poppet	Right	Gear	Thermo	Tub	Spl-Pres	Piston	Dual	Remy	Hand	Rayfield	Grav	Acet	Disco
Herreshoff, 4-30	4	3.38x4.50	18.25	161.0	T Head	Block	Poppet	Opp	Gear	Thermo	Tub	Splash	Piston	Dual	Briggs	Fixed	Stromberg	Grav	....	....
Herreshoff, 6-36	6	3.38x4.50	27.40	241.5	T Head	Block	Poppet	Opp	Gear	Thermo	Tub	Splash	Piston	Dual	Briggs	Fixed	Stromberg	Grav	....	....
Holly, A	6	4.00x5.00	38.40	376.9	T Head	Threes	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Doub	Remy	Opt	Grav	....	Opt	....
Hudson, 37	4	4.13x5.25	27.25	280.6	L Head	Block	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Dual	Delco	Hand	Zenith	Pres	Elec	Delco
Hudson, 54	6	4.13x5.50	40.90	441.0	L Head	Threes	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Dual	Delco	Hand	Zenith	Pres	Elec	Delco
Hupmobile, C	4	3.25x3.38	16.90	112.0	L Head	Pairs	Poppet	Left	Gear	Thermo	Tub	Splash	Noncir	Sing	Bosch	Fixed	Breeze	Grav	....	....
Hupmobile, E	4	3.25x3.38	16.90	112.0	L Head	Pairs	Poppet	Left	Gear	Thermo	Tub	Splash	Noncir	Sing	Bosch	Fixed	Breeze	Grav	....	....
Hupmobile, H	4	3.25x5.50	16.90	182.5	L Head	Block	Poppet	Left	Chain	Thermo	Cell	Splash	Flywheel	Sing	Bosch	Hand	Zenith	Grav	....	....
Imperial, 34	4	4.50x5.25	32.40	334.0	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Splash	Flywheel	Dual	Remy	Hand	Schebler	Grav	Elec	Northeast
Imperial, 44	4	4.75x5.25	36.10	272.1	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Splash	Flywheel	Dual	Remy	Hand	Schebler	Grav	Elec	Northeast
Interstate, 45	6	4.00x5.00	38.40	376.9	L Head	Block	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Gear	Doub	Mea	Hand	Optional	Pres	Elec	Apple
Jackson, Olympic	4	4.13x4.75	27.25	253.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Piston	Dual	Remy	Hand	Schebler	Grav	Acet	Disco.
Jackson, Majestic	4	4.50x5.25	32.40	334.0	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Piston	Dual	Remy	Hand	Schebler	Grav	Acet	Disco
Jackson, Sultanic	6	4.13x4.75	40.90	380.8	L Head	Pairs	Poppet	Left	Chain	Pump	Cell	Spl-Pres	Piston	Dual	Remy	Hand	Schebler	Grav	Elec	....
Keeton, 48	6	3.75x5.50	33.75	364.4	L Head	Block	Poppet	Left	Gear	Thermo	Tub	Spl-Pres	Gear	Sing	Bosch	Fixed	Own	Grav	Elec	....
King, Roadster	4	3.83x5.13	22.50	226.4	L Head	Block	Poppet	Side	Gear	Thermo	Tub	Pressure	....	Dual	Briggs	Hand	Stromberg	Grav	....	....
King, Touring	4	4.00x5.50	25.60	276.5	L Head	Block	Poppet	Side	Gear	Thermo	Tub	Pressure	....	Dual	Briggs	Hand	Stromberg	Grav	....	....
Kissel, 30	4	4.25x4.25	28.90	241.1	L Head	Pairs	Poppet	Left	Chain	Pump	Cell	Splash	Gear	Dual	Esterline	Hand	Stromberg	Grav	Elec	Own
Kissel, 40	4	4.50x5.25	32.40	334.0	L Head	Pairs	Poppet	Left	Chain	Pump	Cell	Splash	Gear	Dual	Esterline	Hand	Stromberg	Grav	Elec	Own
Kissel, 50	4	4.88x5.00	38.00	373.3	L Head	Pairs	Poppet	Left	Chain	Pump	Cell	Splash	Gear	Dual	Esterline	Hand	Stromberg	Grav	Elec	Own
Kissel, 60	6	4.50x5.25	48.60	501.0	L Head	Pairs	Poppet	Left	Chain	Pump	Cell	Splash	Gear	Dual	Esterline	Hand	Stromberg	Grav	Elec	Own
Klinekar, 30	4	4.00x4.63	25.60	232.5	T Head	Sep'rt	Poppet	Right	Gear	Pump	Tub	Splash	Gear	Doub	Bosch	Hand	....	Grav	Opt	Optional
Klinekar, 40	4	4.25x5.50	28.90	312.0	T Head	Pairs	Poppet	Opp	Gear	Pump	Tub	Splash	Gear	Doub	Bosch	Hand	....	Grav	Mech	Everready
Klinekar, 50	6	4.10x5.00	39.90	389.5	T Head	Sep'rt	Poppet	Opp	Gear	Pump	Tub	Splash	Gear	Doub	Bosch	Hand	....	Grav	Mech	Everready
Klinekar, 60	6	4.25x5.50	43.40	468.0	T Head	Pairs	Poppet	Opp	Gear	Pump	Tub	Splash	Gear	Doub	Bosch	Hand	....	Grav	Mech	Everready
Knox, 44	4	5.00x5.50	40.00	431.3	Straight	Sep'rt	Poppet	Head	Gear	Pump	Cell	Pressure	Gear	Doub	Bosch	Hand	Stromberg	Grav	Acet	Perkins
Knox, 45	4	5.00x5.50	40.00	431.3	Straight	Sep'rt	Poppet	Head	Gear	Pump	Cell	Pressure	Gear	Doub	Bosch	Hand	Stromberg	Grav	Acet	Perkins
Knox, 46	6	4.38x5.50	45.94	496.0	Straight	Pairs	Poppet	Head	Gear	Pump	Cell	Pressure	Gear	Doub	Bosch	Hand	Rayfield	Grav	Acet	Perkins
Knox, 66	6	5.00x5.50	60.00	646.7	Straight	Pairs	Poppet	Head	Gear	Pump	Cell	Pressure	Gear	Doub	Bosch	Hand	Stromberg	Grav	Acet	Perkins
Krit, K	4	3.70x4.00	22.50	176,7	L Head	Block	Poppet	Right	Hel'l	Thermo	Tub	Splash	Piston	Sing	Bosch	Fixed	Stromberg	Grav	....	....
Lambert, Buckeye, 40	4	3.25x5.25	16.90	174.2	L Head	Block	Poppet	Right	Gear	Pump	Tub	Splash	Gear	Dual	Remy	Hand	Schebler	Grav	....	....
Lambert, 99	4	4.25x5.25	28.90	297.8	L Head	Sep'rt	Poppet	Left	Gear	Pump	Tub	Spl-Pres	Gear	Dual	Remy	Hand	Schebler	Grav	....	....
Lenox, Four	4	4.25x5.50	28.90	312.0	L Head	Block	Poppet	Right	Gear	Pump	Cell	Spl-Pres	Piston	Dual	Spld'rf	Hand	Own	Grav	Elec	Gray & Da.
Lenox, Six	6	4.00x5.00	38.40	376.9	T Head	Threes	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Piston	Sing	Mea	Hand	Own	Grav	Elec	Gray & Da.
Lexington, 13	6	4.13x5.25	40.90	420.9	L Head	Threes	Poppet	Right	Gear	Pump	Cell	Pressure	Piston	Doub	....	Hand	....	Pres	Elec	E. L. & S.
Lion, 30	4	3.50x5.00	19.60	192.4	L Head	Block	Poppet	Right	Hel'l	Thermo	Cell	Splash	Piston	Dual	Remy	Hand	Own	Grav	....	....
Little Four, A	4	3.50x3.28	19.60	129.9	L Head	......	Poppet	Left	Gear	Thermo	Tub	Splash	Noncir	Doub	Briggs	Hand	Kingston	Grav	....	....
Locomobile, L	4	4.50x4.50	32.40	286.3	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Dual	Bosch	Hand	Own	Grav	Acet	Disco
Locomobile, R	6	4.25x5.00	43.40	425.4	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Dual	Bosch	Hand	Own	Grav	Acet	Disco.
Locomobile, M	6	4.50x5.50	48.60	524.8	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Dual	Bosch	Hand	Own	Grav	Acet	Disco
Lozier, 77	6	3.63x5.50	31.60	340.7	L Head	Threes	Poppet	Right	Gear	Pump	Tub	Spl-Pres	Gear	Sing	Bosch	Hand	Rayfield	Pres	Elec	Gray & Da.
Lozier, 72	6	4.63x5.50	51.60	554 4	T Head	Pairs	Poppet	Opp	Spiral	Pump	Tub	Spl-Pres	Gear	Dual 2	Bosch	Hand	Own	Pres	Elec	Gray & Da.
Luverne, 780	6	4.25x5.25	43.40	446.7	L Head	Pairs	Poppet	Left	Gear	Thermo	Tub	Splash	Gear	Dual	....	Hand	Schebler	Grav	Elec	Gray & Da.
Marathon, Runner	4	3.50x4.50	19.60	173.2	L Head	Pairs	Poppet	Right	Gear	Thermo	Tub	Splash	Flywheel	Dual	Remy	Hand	Schebler	Grav	....	....
Marathon, Winner	4	4.25x4.50	28.90	255.3	L Head	Pairs	Poppet	Right	Gear	Thermo	Tub	Splash	Flywheel	Dual	Remy	Hand	Schebler	Grav	....	....
Marathon, Champion	4	4.50x5.13	32.40	326.1	L Head	Pairs	Poppet	Right	Gear	Thermo	Tub	Splash	Flywheel	Dual	Remy	Hand	Schebler	Grav	....	....
Marion, 38A & 37A	4	4.00x5.00	25.60	251.3	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Spld'rf	Hand	Schebler	Grav	Acet	Disco
Marion, 48A	4	4.13x5.50	27.25	294.0	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Spld'rf	Hand	Schebler	Grav	Elec	....
Marmon, 32	4	4.50x5.00	32.40	318.1	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual 2	Bosch	Hand	Harroun	Grav	Elec	Northeast
Marmon, Six	6	4.50x6.00	48.60	572.5	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual 2	Bosch	Hand	Harroun	Pres	Elec	Northeast
Mason, A, B, C	2	5.00x5.00	20.00	196.4	Straight	Sep'rt	Poppet	Head	Gear	Pump	Tub	Splash	....	Dual	Spld'rf	Hand	Schebler	Grav	....	....
Mason, K	4	4.00x4.50	25.60	226.2	L Head	Block	Poppet	Right	Gear	Thermo	Cell	Splash	Piston	Dual	Spld'rf	Hand	Schebler	Grav	....	....
Matheson, C	6	4.50x5.00	48.60	477.1	Straight	Pairs	Poppet	Head	Gear	Pump	Cell	Splash	Gear	Doub	Bosch	Hand	Stromberg	Pres	Elec	Westing'se

*Underslung Frame. †Has six wheels.

ABBREVIATIONS:—Model: Tour, touring; Road, roadster. **Cylinders:** Sep'rt, separate; **Valve Location:** Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. **Camshaft Drive:** Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. **Cooling Circulation:** Thermo thermo-syphon. **Radiator:** Cell, cellular; Tub, tubular. **Lubrication:** Spl-Pres, combined splash and pressure system in circulating unless called Noncir. **Ignition:** Sing, single; Doub, double; Dual, 2, double distributer; Gov, governor; Atw Kent, Atwater Kent. **Fuel Feed:** Grav, gravity; Pres, pressure. **Engine Starter:** Spr, spring; Elec, electric; Acet, acetlyene; Mech, mechanical; Opt, optional; Air, compressed air. **Bore and Stroke:** In decimals to nearest 1-100 inch, as 4.25=4¼, etc., .06=1/16, .19=3/16, .13=1/8, .25=1/4, .31=5/16, .38=3/8, .44=7/16, .5=1/2, .56=9/16, .63=5/8, .60=11/16, .75=3/4, .81=13/16, .88=7/8.

Horsepower and Mechanical Details

TRANSMISSION								RUNNING GEAR								CONTROL			BEARINGS				3
Clutch Type	GEARSET Type	GEARSET Location	GEARSET Forward Speeds	Drive	Car Drives Through	Rear Axle	Total Gear Ratio on High	Wheelbase	TIRES Front	TIRES Rear	WHEELS Kind	WHEELS Attachment	SPRINGS Front	SPRINGS Rear	Front Axle	Location Steering Wheel	Gearshift Location	Emergency Brake Control	Crankshaft Type and No.	Gearset	Rear Axle	Front Wheel	Chassis Weight, Lbs.
Cone	Sel	Amid	3	Bevel	....	Float	....	142	37x5	37x5	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	....	......	......	......	....
Disk	Sel	Unit M	3	Bevel	Tor T	Float	....	113	34x4	34x4	Wood	....	½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 2	Ball	B&R	Ball	2,000
Cone	Sel	Amid	3	Bevel	Tor T	Semi F	....	128	36x4	36x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Roll	Roll	Roll	2,600
Cone	Sel	Unit M	3	Bevel	Tor T	Float	3.53-1	118	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 5	Ball	Ball	Ball	2,000
Cone	Sel	Amid	3	Bevel	Springs	Semi F	....	116	34x4	35x4½	Wood	....	½ Ell	Plat	I-Beam	Right	Right	Right	Plain, 5	Roll	Roll	Ball	2,600
Cone	Sel	Amid	3	Bevel	Rad Rd	Float	....	123	36x4	37x4½	Wood	....	½ Ell	Plat	I-Beam	Right	Right	Right	Plain, 5	Roll	Roll	Ball	2,960
Cone	Sel	Amid	3	Bevel	Rad Rd	Semi F	4.50-1	112	33x4	33x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Roll	Ball	2,650
Disk	Sel	Amid	3	Bevel	Rad Rd	Float	4.50-1	118	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 5	Ball	Ball	Ball	3,400
Disk	Sel	Unit M	3	Bevel	Rad Rd	Float	3.75-1	122	36x4	36x4	Wood	....	½ Ell	Plat	I-Beam	Right	Right	Right	Plain, 4	Ball	B&R	Ball	....
Disk	Sel	Unit M	3	Bevel	Rad Rd	Float	3.50-1	128	36x4	36x4	Wood	....	½ Ell	Plat	I-Beam	Right	Right	Right	Plain, 4	Ball	B&R	Ball	....
Con Bd	Sel	Amid	3	Bevel	Tor T	Float	3.66-1	120	36x4½	36x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	2,340
Cone	Sel	Unit X	3	Bevel	Springs	Semi F	3.64-1	116	34x4	34x4	Wood	....	½ Ell	¾ Ell	I-Beam	Left	Cent	Pedal	Plain, 3	Ball	Roll	Ball	2,200
Disk	Sel	Unit M	4	Bevel	Tor T	Semi F	4.00-1	100	34x4	34x4	Wood	....	½ Ell	Plat	I-Beam	Left	Cent	Pedal	Plain, 3	B&P	B&R	Ball	1,600
Disk	Sel	Unit M	4	Bevel	Tor T	Semi F	4.00-1	124	34x4	34x4	Wood	....	½ Ell	Plat	I-Beam	Left	Cent	Pedal	Plain, 3	B&P	B&R	Ball	1,600
Cone	Sel	Unit X	......	Bevel	Tor T	¾ Float	3.50-1	130	36x4½	36x4½	Wire	Dem	½ Ell	½ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Ball	Ball	....
Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.90-1	118	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	2,600
Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.43-1	127	36x4½	36x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	3,000
Disk	Sel	Unit M	2	Bevel	Rad Rd	......	4.50-1	86	30x3	30x3	Wood	....	½ Ell	Cross	I-Beam	Right	Right	Right	Plain, 3	B&P	Roll	Roll	1,500
Disk	Sel	Unit M	2	Bevel	Rad Rd	......	4.50-1	110	30x3	30x3	Wood	....	½ Ell	Cross	I-Beam	Right	Right	Right	Plain, 3	B&P	Roll	Roll	1,600
Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.86-1	106	32x3½	32x3½	Wood	....	½ Ell	Cross	I-Beam	Right	Cent	Cent	Plain, 3	B&R	Roll	Roll	1,800
Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.50-1	118	34x4	34x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Ball	B&R	Roll	....
Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.50-1	122	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Ball	B&R	Ball	....
Disk	Sel	Unit M	4	Bevel	Springs	Float	3.50-1	132	36x4½	36x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Ball	Ball	2,800
Cone	Sel	Unit M	3	Bevel	Rad Rd	Semi F	3.50-1	115	34x4	34x4	Wood	....	Ell	Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	B&R	Ball	2,000
Cone	Sel	Unit M	3	Bevel	Rad Rd	Semi F	3.50-1	124	36x4	36x4	Wood	....	Ell	Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	B&R	Ball	2,400
Cone	Sel	Unit M	3	Bevel	Rad Rd	Float	3.50-1	138	36x4½	36x4½	Wood	Dem	Ell	Ell	I-Beam	Right	Right	Right	Plain, 4	Ball	Ball	Ball	2,800
Disk	Sel	Amid	4	Bevel	Tor T	Float	Opt	131	36x4	37x4½	Wire	Dem	½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 4	Ball	Ball	Ball	3,200
Disk	Sel	Unit M	3	Bevel	Tor T	Float	....	110	32x3½	32x3½	Wood	....	½ Ell	Flat	....	Left	Cent	Cent	Plain	......	......	......	....
Disk	Sel	Unit M	3	Bevel	Tor T	Float	....	115	34x4	34x4	Wood	....	½ Ell	Flat	....	Left	Cent	Cent	Plain	......	......	......	....
Cone	Sel	Amid	3	Bevel	Springs	Float	3.75-1	116	34x4	34x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Roll	Roll	....
Cone	Sel	Amid	4	Bevel	Springs	Float	3.75-1	121	35x4½	35x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Roll	Roll	....
Cone	Sel	Amid	4	Bevel	Springs	Float	3.75-1	132	36x4½	36x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Roll	Roll	....
Cone	Sel	Amid	4	Bevel	Springs	Float	3.75-1	140	37x5	37x5	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 4	Ball	Roll	Roll	....
Cone	Sel	Amid	4	Bevel	Tor T	¾ Float	....	115	34x4	34x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 5	Ball	Ball	Ball	....
Cone	Sel	Amid	4	Bevel	Tor T	¾ Float	....	118	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 5	Ball	Ball	Ball	....
Cone	Sel	Amid	4	Bevel	Tor T	¾ Float	....	126	36x4½	36x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 7	Ball	Ball	Ball	....
Cone	Sel	Amid	4	Bevel	Tor T	¾ Float	....	132	37x5	37x5	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 7	Ball	Ball	Ball	....
Disk	Sel	Unit M	3	Bevel	Rad Rd	Float	3.50-1	122	36x4½	36x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 5	Ball	Ball	Roll	2,200
Disk	Sel	Unit M	3	Bevel	Rad Rd	Float	3.30-1	126	37x5	37x5	Wood	....	½ Ell	¾ Ell	I-Beam	Opt	Cent	Cent	Plain, 5	Ball	Ball	Roll	2,740
Disk	Sel	Unit M	3	Bevel	Springs	Float	3.50-1	134	38x5	38x5	Wood	....	½ Ell	¾ Ell	I-Beam	Opt	Cent	Cent	Plain, 4	Ball	Ball	Roll	3,700
Disk	Sel	Unit M	3	Bevel	Rad Rd	Float	3.00-1	134	38x5½	38x5½	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 4	Ball	Ball	Roll	3,120
Disk	Sel	Unit M	3	Bevel	Tor T	Semi F	4.00-1	106	32x3½	32x3½	Wood	....	½ Ell	Ell	I-Beam	Left	Left	Left	Ball, 2	Ball	Roll	Ball	1 500
....	Frict	Amid	......	Chain	Rad Rd	Semi F	....	112	32x3½	32x3½	Wood	....	½ Ell	Ell	I-Beam	Right	Right	Right	Plain, 5	......	Roll	Ball	2,000
....	Frict	Amid	......	Chain	Rad Rd	Semi F	....	117	34x3½	34x3½	Wood	....	½ Ell	Ell	I-Beam	Right	Right	Right	Plain, 5	......	Roll	Ball	2,100
Cone	Sel	Unit X	3	Bevel	Tor T	Float	....	118	34x4	34x4	Wood	....	½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Ball	Ball	....
Cone	Sel	Unit X	3	Bevel	Tor T	Float	....	130	35x4½	35x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Ball	Ball	....
Cone	Sel	Unit M	3	Bevel	Springs	Float	3.33-1	120	36x4½	36x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Roll	Roll	....
Cone	Sel	Amid	3	Bevel	Springs	Semi F	4.00-1	110	32x3½	32x3½	Wood	....	½ Ell	¾ Ell	I-Beam	Left	Left	Cent	Plain, 3	Roll	Roll	Ball	1,800
Cone	Sel	....	2	....	Springs	Semi F	....	90	30x3½	30x3½	Wood	....	½ Ell	¾ Ell	Tub	Right	Right	......	Plain, 3	Plain	B&R	Ball	1,640
Cone	Sel	Amid	4	Bevel	Rad Rd	Float	3.54-1	120	34x4½	34x4½	Wood	....	½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Roll	3,430
Disk	Sel	Amid	4	Bevel	Rad Rd	Float	3.54-1	128	36x4½	36x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 7	Ball	Ball	Roll	4,180
Disk	Sel	Amid	4	Bevel	Rad Rd	Float	3.21-1	136	36x4½	37x5	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 7	Ball	Ball	Roll	4,380
Disk	Sel	Unit M	3	Bevel	Tor T	Semi F	3.75.1	127½	36x4½	36x4½	Wood	....	½ Ell	½ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Ball	Ball	....
Disk	Sel	Amid	4	Bevel	Rad Rd	Float	2.76-1	131	36x4½	37x5	Wood	....	½ Ell	Plat	I-Beam	Left	Cent	Cent	Ball, 4	Ball	Ball	Roll	2,990
Disk	Sel	Unit M	3	Bevel	Rad Rd	Float	3.75-1	130	37x5	37x5	Wood	....	½ Ell	¾ Ell	I-Beam	Left	Cent	Left	Plain, 5	Ball	B&R	Ball	2,600
Disk	Sel	Unit M	3	Bevel	Tor T	Semi F	4.00-1	104	32x3½	32x3½	Wood	....	½ Ell	Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	B&R	Ball	2,200
Disk	Sel	Unit M	3	Bevel	Tor T	Float	4.00-1	116	34x4	34x4	Wood	....	½ Ell	Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,000
Disk	Sel	Unit M	3	Bevel	Tor T	Float	4.00-1	123	36x4	36x4	Wood	....	½ Ell	Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,400
Cone	Sel	Unit X	3	Bevel	S & T T	Semi F	3.50-1	112	34x4	34x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Ball	Roll	Ball	2,540
Cone	Sel	Unit X	3	Bevel	S & T T	Float	3.50-1	120	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Ball	Roll	Roll	2,865
Cone	Sel	Unit X	3	Bevel	Tor T	Float	Opt	120	35x4½	35x4½	Wood	....	½ Ell	Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Ball	Roll	2,800
Disk	Sel	Unit X	3	Bevel	Tor T	Float	Opt	145	36x4½	37x5	Wood	....	½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 7	Ball	Ball	Roll	3,250
Cone	Plan	Unit M	2	Chain	Rad Rd	Dead	3.50-1	96	32x3½	32x3½	Wood	....	½ Ell	Ell	Tube	Right	Right	Right	Plain, 2	Plain	Roll	Roll	....
Disk	Sel	Unit M	3	Bevel	Springs	Semi F	3.50-1	116	36x3½	36x3½	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 2	Ball	Roll	Ball	....
Disk	Sel	Unit X	3	Bevel	Rad Rd	Float	3.00-1	135	37x5	37x5	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 4	Ball	Ball	Roll	2,950

ABBREVIATIONS:—**Clutch Type:** Exp Bd, expanding band; Con Bd, contracting band. **Gearset:** Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; Unit M, unit with motor; Unit X, unit with rear axle; Amid, amidships. **Drive:** Bevel, shaft with bevel gear at rear axle; Worm, shaft with worm gear at rear axle. **Car Drives through:** Tor T, torsion tube; S & T T, springs and torsion tube; R & T R, radius rods and torsion rod; Rad Rd, radius rods; S & R R, springs and radius rods; Tor Rd, torsion rod. **Rear Axle:** Float, floating; Semi-F, semi-floating; ¾ Float, ¾ floating. **Wheel Attachment:** Dem, demountable. **Springs:** ½ Ell, semi-elliptic; Ell, elliptic; ¾-Ell, ¾ elliptic; Plat, platform. **Front Axle:** Tub, tubular. **Control Location Steering:** Cent, center. **Bearings:** Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller; B R & P, ball, roller and plain.

Passenger Car Chassis Listed for 1913

4					CYLINDERS		VALVES			COOLING		LUBRICATION		IGNITION			CARBURETION		ENGINE STARTER	
NAME AND MODEL	No. of Cylinders	Bore and Stroke, Inches	S. A. E. H. P.	Piston Displacement Cubic Inches	Shape	How Cast	Type	Location	Camshaft Drive	Circulation	Radiator	System	Type of Pump	System	Magneto Generator	Control	Make of Carburetor	Fuel Feed	Type	Make
Maxwell, 4	4	3.75x4.00	22.50	176.7	T Head	Pairs	Poppet	Opp	Gear	Thermo	Cell	Splash	Piston	Dual	Spld'rf	Hand	Own	Grav	Acet	Own
Maxwell, 8	4	4.00x4.63	25.60	232.5	T Head	Pairs	Poppet	Opp	Gear	Thermo	Cell	Splash	Gear	Dual	Spld'rf	Hand	Own	Grav	Acet	Own
Maxwell, 10	4	4.25x5.25	28.90	297.8	T Head	Sep'rt	Poppet	Opp	Gear	Thermo	Cell	Splash	Gear	Dual	Spld'rf	Hand	Own	Grav	Acet	Own
McFarlan, S	6	4.00x5.00	38.40	376.9	T Head	Threes	Poppet	Opp	Hel'l	Pump	Cell	Spl-Pres	Gear	Dual	Eisemann	Hand	Stromberg	Pres	Air	Own
McFarlan, T	6	4.00x6.00	38.40	452.4	T Head	Block	Poppet	Opp	Hel'l	Pump	Cell	Splash		Dual	Eisemann	Hand	Stromberg	Pres	Air	Own
McFarlan, M	6	4.25x5.00	43.40	425.4	Straight	Pairs	Poppet	Head	Hel'l	Pump	Cell	Splash	Flywheel	Dual	Eisemann	Hand	Stromberg	Grav	Air	Own
McIntyre, G	6	3.50x4.50	29.40	259.8	T Head	Block	Poppet	Opp	Gear	Thermo	Cell	Splash	Piston	Dual		Hand	Stromberg	Grav		
McIntyre	6	3.50x4.50	29.40	259.8	T Head	Block	Poppet	Opp	Spiral	Thermo	Cell	Splash	Piston	Dual		Hand	Stromberg	Grav	Elec	
Mercer, J&K	4	4.38x5.00	30.63	300.7	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Dual 2	Bosch	Hand	Fletcher	Pres		
Mercer, G&H	4	4.50x5.00	32.40	318.1	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Dual 2	Bosch	Hand	Fletcher	Pres		
Metz, 22	4	3.75x4.00	22.50	176.7	L Head	Block	Poppet	Right	Gear	Thermo	Tub	Splash	Gear	Sing	Bosch	Fixed		Grav		
Michigan, R & S	4	4.25x5.25	28.90	297.8	L Head	Block	Poppet	Right	Gear	Pump	Cell	Splash	Piston	Dual	Briggs	Hand	Schebler	Grav	Opt	
Michigan, L & O	4	4.06x4.50	26.40	233.3	L Head	Block	Poppet	Right	Gear	Pump	Cell	Splash	Piston	Dual	Briggs	Hand	Schebler	Grav	Opt	
Midland, T-4	4	4.50x5.00	32.40	318.1	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Sing	Gray & Da.	Hand	Optional	Pres	Elec	Gray & Da.
Midland, T-6	6	4.00x5.00	38.40	376.9	T Head	Threes	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Sing	Gray & Da.	Hand	Optional	Pres	Elec	Gray & Da.
Miller, 40	4	4.13x5.15	27.25	234.0	L Head	Block	Poppet	Right	Gear	Pump	Cell	Pressure	Piston	Dual	Kingston	Hand	Chapin	Grav		
Mitchell, 5-4	4	4.25x7.00	28.90	397.2	T Head	Pairs	Poppet	Opp	Hel'l	Pump	Cell	Spl-Pres	Gear	Dual	Bosch	Hand		Pres	Elec	Esterline
Mitchell, 5-6	6	3.75x6.00	33.75	397.5	T Head	Pairs	Poppet	Opp	Hel'l	Pump	Cell	Spl-Pres	Gear	Dual	Bosch	Hand		Pres	Elec	Esterline
Mitchell, 7-6	6	4.25x7.00	43.80	595.8	T Head	Pairs	Poppet	Opp	Hel'l	Pump	Cell	Spl-Pres	Gear	Dual	Bosch	Hand		Pres	Elec	Esterline
Moline, M-40	4	4.13x6.00	27.25	327.4	L Head	Pairs	Poppet	Left	Gear	Thermo	Tub	Spl-Pres	Noncir	Doub	Bosch	Hand	Schebler	Grav	Elec	Ward-Le'd.
Moon, 39	4	4.00x5.75	25.60	289.0	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Remy	Hand	Stromberg	Grav	Elec	Wagner
Moon, 48	4	4.50x5.00	32.40	318.1	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Remy	Hand	Stromberg	Grav	Elec	Wagner
Moon, 65	6	4.00x5.75	38.40	433.5	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Stromberg	Grav	Elec	Wagner
Morse	4	4.63x5.00	34.25	336.0	Straight	Sep'rt	Poppet	Head	Gear	Pump	Cell	Splash	Gear	Dual	Eisemann	Hand	Stromberg	Grav	Opt	Optional
Motorette, L, M & R	2	3.75x3.75	11.25	82.8	L Head	Sep'rt	Poppet	Side	Gear	Thermo	Tub	Splash	Gear	Sing	Bosch	Fixed	Holley	Grav		
Moyer, B & E	4	4.50x5.00	32.40	318.1	T Head	Pairs	Poppet	Opp	Gear	Pump	Tub	Spl-Pres	Gear	Dual	Mea	Hand	Schebler			
Moyer, D & F	6	4.00x5.00	38.40	376.9	T Head	Threes	Poppet	Opp	Gear	Pump	Tub	Spl-Pres	Gear	Dual	Mea	Hand	Schebler			
National, Series V	4	4.88x6.00	38.00	448.0	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Doub	Bosch	Hand	Rayfield	Pres	Elec	Gray & Da.
National, Series V	4	4.88x6.00	38.00	448.0	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Doub	Bosch	Hand	Rayfield	Pres	Elec	Gray & Da.
National, Series V	4	4.88x6.00	38.00	448.0	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Doub	Bosch	Hand	Rayfield	Pres	Elec	Gray & Da.
Norwalk, A*	6	4.00x5.00	38.40	376.9	T Head	Threes	Poppet	Opp	Spi'l	Pump	Tub	Splash	Gear	Sing	Atw Kent	Hand	Carter	Grav	Elec	Gray & Da.
Norwalk, A*	6	4.00x5.00	38.40	376.9	T Head	Threes	Poppet	Opp	Spi'l	Pump	Tub	Splash	Gear	Sing	Atw Kent	Hand	Carter	Pres	Elec	Gray & Da.
Norwalk, B*	6	4.50x5.50	48.60	524.8	T Head	Threes	Poppet	Opp	Spi'l	Pump	Tub	Splash	Gear	Sing		Hand	Carter	Pres	Elec	
Nyberg, 437	4	3.75x5.25	22.50	231.9	L Head	Block	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Doub	Remy	Hand	Optional	Pres	Opt	Optional
Nyberg, 440	4	4.25x5.25	28.90	297.8	L Head	Sep'rt	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Doub	Remy	Hand	Optional	Pres	Opt	Optional
Nyberg, 645R	6	3.75x6.00	43.80	397.5	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Remy	Hand	Optional	Pres	Opt	Optional
Nyberg, 645T	6	3.75x6.00	43.80	397.5	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Remy	Hand	Optional	Pres	Opt	Optional
Nyberg, 660R	6	4.25x5.25	43.80	446.7	L Head	Sep'rt	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Gear	Dual	Remy	Hand	Optional	Pres	Opt	Electric
Nyberg, 660T	6	4.25x5.25	43.80	446.7	L Head	Sep'rt	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Gear	Dual	Remy	Hand	Optional	Pres	Opt	Electric
Oakland, 35	4	3.50x5.00	19.60	192.4	L Head	Block	Poppet	Left	Gear	Pump	Tub	Splash	Piston	Doub	Deaco	Hand		Grav		
Oakland, 42	4	4.13x4.75	27.25	253.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Doub	Deaco	Hand	Schebler	Pres	Air	Own
Oakland, 6-60	6	4.13x4.75	40.90	380.8	L Head	Pairs	Poppet	Left	Chain	Pump	Cell	Splash	Piston	Doub	Deaco	Hand	Stromberg	Pres	Air	Own
Oldsmobile, 53	6	4.13x4.75	40.90	380.8	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-Pres		Sing	Delco	Hand	Stromberg	Pres	Elec	Delco
Omaha, 30*	4	4.06x4.50	26.40	233.3	L Head	Block	Poppet	Right	Gear	Pump	Tub	Splash	Piston	Dual	Spld'rf	Hand	Rayfield	Grav		
Only, A	4	4.25x7.88	28.90	446.8	T Head	Block	Poppet	Opp	Gear	Pump	Tub	Spl-Pres	Gear	Doub	Bosch	Hand	Own	Pres		
Overland, 69	4	4.00x4.50	25.60	226.2	L Head	Sep'rt	Poppet	Left	Gear	Thermo	Cell	Spl-Pres	Noncir	Dual	Remy	Hand	Schebler	Grav	Acet	Own
Overland, 71	4	4.38x4.50	30.63	270.6	L Head	Sep'rt	Poppet	Left	Gear	Thermo	Cell	Splash	Gear	Dual	Remy	Hand	Schebler	Grav	Acet	Own
Pacific Special, A & B	4	4.50x5.00	32.40	318.1	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Splash	Gear	Dual	Bosch	Hand	Stromberg	Grav	Acet	Prestolite
Packard, Runabout, 38	6	4.00x5.50	38.40	414.8	L Head	Pairs	Poppet	Right	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand	Own	Pres	Elec	Delco
Packard, Touring, 38	6	4.00x5.50	38.40	414.8	L Head	Pairs	Poppet	Right	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand	Own	Pres	Elec	Delco
Packard, Phaeton, 38	6	4.00x5.50	38.40	414.8	L Head	Pairs	Poppet	Right	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand	Own	Pres	Elec	Delco
Packard, Runabout, 48	6	4.50x5.50	48.60	524.8	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand	Own	Pres		
Packard, Touring, 48	6	4.50x5.50	48.60	524.8	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand	Own	Pres		
Paige, 25	4	3.75x4.00	22.50	176.7	L Head	Block	Poppet	Left	Gear	Thermo	Cell	Splash	Piston	Dual	Spld'rf	Hand	Mayer	Grav		
Paige, 36	4	4.00x5.00	25.60	251.3	L Head	Block	Poppet	Left	Chain	Pump	Tub	Spl-Pres	Piston	Sing	Bosch	Hand	Own	Grav	Elec	Gray & Da.
Palmer-Singer, Brighton	6	4.00x5.00	38.40	376.9	T Head	Threes	Poppet	Opp	Spi'l	Pump	Cell	Spl-Pres	Gear	Dual	Eisemann	Hand	C. R. G	Pres	Air	Own
Palmer-Singer, LXIV	6	4.88x5.50	57.00	615.0	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Gear	Dual	Eisemann	Hand	C. R. G	Pres	Air	Own
Paterson, 43	4	4.13x4.75	27.25	253.9	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Gear	Dual	Deaco	Hand	Schebler	Grav	Elec	Deaco
Paterson, 47	4	4.50x5.25	32.40	334.0	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Gear	Dual	Deaco	Hand	Schebler	Grav	Elec	Deaco
Pathfinder	4	4.13x5.25	27.25	280.6	L Head	Block	Poppet	Left	Gear	Thermo	Cell	Splash	Piston	Dual	Eisemann	Hand	Schebler	Grav	Elec	Gray & Da.
Peerless, 29	4	4.00x4.63	25.60	232.5	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Splash	Piston	Dual	Bosch	Hand	Own	Grav		
Peerless, 35	6	4.00x5.50	38.40	414.8	T Head	Pairs	Poppet	Opp	Gear	Pump	Tub	Splash	Piston	Dual	Bosch	Hand	Own	Pres	Elec	Own
Peerless, 36	6	4.50x6.00	48.60	572.5	T Head	Pairs	Poppet	Opp	Gear	Pump	Tub	Splash	Piston	Dual	Bosch	Hand	Own	Pres	Elec	Own
Peerless, 37	6	5.00x7.00	60.00	824.8	T Head	Pairs	Poppet	Opp	Gear	Pump	Tub	Splash	Piston	Dual	Bosch	Hand	Own	Pres	Elec	Own
Perfex, 2	4	3.75x4.50	22.50	198.8	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Spl-Pres	Gear	Dual	Spld'rf	Hand	Stromberg	Grav		
Pierce-Arrow, 38C	6	4.00x5.50	38.40	414.8	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Doub	Bosch	Hand	Own	Grav	Air	Own
Pierce-Arrow, 48D	6	4.50x5.50	48.60	524.8	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Own	Pres	Acet	Disco
Pierce-Arrow, 48B	6	4.50x5.50	48.60	524.8	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Doub	Bosch	Hand	Own	Grav	Air	Own
Pierce-Arrow, 66A	6	5.00x7.00	60.00	824.8	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand	Own	Grav	Air	Own

*Underslung Frame. †Has six wheels.

ABBREVIATIONS:—Model: Tour, touring; Road, roadster. **Cylinders:** Sep'rt, separate; **Valve Location:** Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. **Camshaft Drive:** Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. **Cooling Circulation:** Thermo, thermo-syphon. **Radiator:** Cell, cellular; Tub, tubular. **Lubrication:** Spl-Pres, combined splash and pressure system in circulating unless called Noncir. **Ignition:** Sing, single; Doub, double; Dual 2, double distributor; Gov, governor; Atw Kent, Atwater Kent. **Fuel Feed:** Grav, gravity; Pres, pressure. **Engine Starter:** Spr, spring; Elec, electric; Acet, acetylene; Mech, mechanical; Opt, optional; Air, compressed air. **Bore and Stroke:** In decimals to nearest 1-100 inch, as 4.25=$4\frac{1}{4}$, etc., .06=$\frac{1}{16}$, .19=$\frac{3}{16}$, .13=$\frac{1}{8}$, .25=$\frac{1}{4}$, .31=$\frac{5}{16}$, .38=$\frac{3}{8}$, .44=$\frac{7}{16}$, .5=$\frac{1}{2}$, .56=$\frac{9}{16}$, .63=$\frac{5}{8}$, .69=$\frac{11}{16}$, .75=$\frac{3}{4}$, .81=$\frac{13}{16}$, .88=$\frac{7}{8}$.

Horsepower and Mechanical Details

TRANSMISSION								RUNNING GEAR								CONTROL			BEARINGS				4
	GEARSET								TIRES		WHEELS		SPRINGS										
Clutch Type	Type	Location	Forward Speeds	Drive	Car Drives Through	Rear Axle	Total Gear Ratio on High	Wheelbase	Front	Rear	Kind	Attachment	Front	Rear	Front Axle	Location Steering Wheel	Gearshift Location	Emergency Brake Control	Crankshaft Type and No.	Gearset	Rear Axle	Front Wheel	Chassis Weight, Lbs.
Disk....	Pro ..	Unit M .	3	Bevel...	Springs...	Semi F	3.50-1	93	30x3½	30x3½	Wood	....	½ Ell..	¾ Ell..	Tub	Left	Cent..	Cent..	Plain, 3 .	P&R .	B&B .	Ball ..	1,550
Disk....	Pro ..	Unit M .	3	Bevel...	Springs...	Semi F	3.82-1	106	32x3½	32x3½	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 3 .	P&R .	B&R .	Ball ..	2,000
Disk....	Sel ...	Unit M .	3	Bevel...	Springs...	Float .	3.50-1	115	36x4	36x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Left	Cent..	Cent..	Plain, 5 .	P&R .	Roll ..	Roll ..	2,900
Disk....	Sel ...	Unit X .	3	Bevel...	Tor T	Float .	Opt	124	37x4½	37x4½	Wood	....	½ Ell..	Ell ...	I-Beam .	Right...	Cent..	Cent..	Plain, 3 .	B&R..	Ball ..	Ball ..	2,400
Disk....	Sel ...	Unit X .	3	Bevel...	Tor T	Float .	Opt	124	37x4½	37x4½	Wood	....	½ Ell..	Ell ...	I-Beam .	Right...	Cent..	Cent..	Plain, 4 .	B&R..	Ball ..	Ball ..	2,400
Disk....	Sel ...	Unit M .	3	Bevel...	T & R R..	Float .	Opt	128	37x4½	37x4½	Wood	....	½ Ell..	Ell ...	I-Beam .	Right...	Cent..	Cent..	Plain, 4 .	Ball ..	Ball ..	Ball ..	2,600
Disk....	Sel ...	Unit M .	4	Bevel...	Springs...	Float .	3.43-1	116	34x4	34x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Cent..	Pedal..	Plain, 3 .	P&B .	Ball ..	Roll ..	2,100
Disk....	Sel ...	Unit M .	4	Bevel...	S & T T .	Float .	3.43-1	116	34x4	34x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Cent..	Pedal..	Plain, 3 .	P&B .	Ball ..	Roll ..	2,100
Disk....	Sel ...	Amid ...	4	Bevel...	Rad Rd...	Float .	....	108	32x4	32x4	Wood	....	½ Ell..	½ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 3 .	Ball ..	Ball ..	Ball ..	....
Disk....	Sel ...	Amid ...	4	Bevel...	Rad Rd...	Float .	....	118	34x4	34x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 3 .	Ball ..	Ball ..	Ball ..	2,550
....	Frict .	Amid ...	5	Chain...	Rad Rd...	Dead .	3.00-1	90	30x3	30x3	Wood	....	Ell ...	Ell ...	Tube....	Left	Cent..	Cent..	Plain, 3 .	Ball ..	Ball ..	Ball ..	....
Cone ...	Sel ...	Amid ...	4	Bevel...	Springs...	Float .	3.50-1	118	35x4½	35x4½	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Left	Cent..	Cent..	Plain, 3 .	Ball ..	Ball ..	Ball ..	3,100
Cone ...	Sel ...	Amid ...	3	Bevel...	Springs...	Float .	3.50-1	114	34x4	34x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Left	Cent..	Cent..	Plain, 2 .	Roll ..	Roll ..	Ball ..	2,850
Disk....	Sel ...	Amid ...	3	Bevel...	Springs...	Float .	3.75-1	121	34x4	34x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Left	Cent..	Cent..	Plain, 3 .	Ball ..	Roll ..	Roll ..	2,650
Disk....	Sel ...	Amid ...	3	Bevel...	Springs...	Float .	3.00-1	134	36x4½	36x4½	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Left	Cent..	Cent..	Plain, 3 .	Ball ..	Roll ..	Roll ..	3,600
Cone ...	Sel ...	Amid ...	3	Bevel...	Rad Rd...	Semi F	....	116	34x4	34x4	Wood	....	½ Ell..	Ell ...	I-Beam .	Right...	Opt...	Cent..	Plain, 3 .	Plain .	Roll..	Ball..	2,300
Cone ...	Sel ...	Amid ...	3	Bevel...	Tor T	Float .	3.60-1	120	36x4	36x4	Wood	....	½ Ell..	⅞ Ell .	I-Beam .	Left	Cent..	Cent..	Plain, 3 .	B&R..	Roll ..	Roll ..	2,800
Cone ...	Sel ...	Amid ...	3	Bevel...	Tor T	Float .	3.60-1	132	36x4	36x4	Wood	....	½ Ell..	⅞ Ell .	I-Beam .	Left	Cent..	Cent..	Plain, 4 .	B&R..	Roll ..	Roll ..	3,400
Cone ...	Sel ...	Amid ...	3	Bevel...	Tor T	Float .	3.60-1	144	36x4½	36x4½	Wood	....	½ Ell..	⅞ Ell .	I-Beam .	Left	Cent..	Cent..	Plain, 4 .	B&R..	Roll ..	Roll ..	3,800
Cone ...	Sel ...	Unit M .	3	Bevel...	Tor T	Semi F	3.50-1	124	36x4	36x4	Wood	....	½ Ell..	Ell ...	I-Beam .	Right...	Right.	Right.	Plain, 3 .	Roll ..	B&R..	Ball ..	2,225
Disk....	Sel ...	Amid ...	3	Bevel...	Springs...	Float .	3.50-1	116	34x4	34x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Left	Cent..	Cent..	Plain, 3 .	Ball ..	B&R..	Roll ..	....
Disk....	Sel ...	Amid ...	3	Bevel...	Springs...	Float .	....	121	36x4	36x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Opt	Opt ..	Opt ..	Plain, 3 .	Ball ..	B&R..	Roll ..	2,700
Disk....	Sel ...	Amid ...	3	Bevel...	Springs...	Float .	3.38-1	132	36x4½	36x4½	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Left	Cent..	Cent..	Plain, 4 .	Ball ..	B&R..	Roll ..	....
Disk....	Sel ...	Amid ...	4	Bevel...	Tor T	Semi F	....	127	36x4½	36x4½	Wood	....	½ Ell..	Ell ...	I-Beam .	Right...	Right.	Right.	Plain, 5 .	Ball ..	Ball ..	Ball ..	2,650
Cone ...	Plan..	Unit M .	2	Chain...	Springs...	Dead .	4.50-1	72	28x3	29x3½	Wood	....	Ell ...	½ Ell..	I-Beam .	Right...	Right.	Pedal..	Plain, 2 .	Plain .	Ball ..	Ball ..	970
Cone ...	Sel ...	Amid ...	3	Bevel...	Rad Rd...	Float .	....	117	34x4	34x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain 3 .	Roll ..	Ball ..	Ball ..	2,800
Cone ...	Sel ...	Amid ...	3	Bevel...	Rad Rd...	Float .	....	122	35x4½	35x4½	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 3 .	Roll ..	Ball ..	Ball ..	3,100
Cone ...	Sel ...	Amid ...	3	Bevel...	Springs...	Float .	3.00-1	128	36x4½	36x4½	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Left	Cent..	Cent..	Plain, 3 .	Ball ..	Roll ..	Roll ..	2,700
Cone ...	Sel ...	Amid ...	3	Bevel...	Springs...	Float .	3.21-1	128	36x5	36x5	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Left	Cent..	Cent..	Plain, 3 .	Ball ..	Roll ..	Roll ..	2,700
Cone ...	Sel ...	Amid ...	3	Bevel...	Springs...	Float .	2.64-1	120	34x4½	34x4½	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Left	Cent..	Cent..	Plain, 3 .	Ball ..	Roll ..	Roll ..	2,600
Disk....	Sel ...	Unit M .	3	Bevel...	Springs...	Float .	3.78-1	127	38x4½	38x4½	Wood	....	½ Ell..	½ Ell..	I-Beam .	Opt	Cent..	Cent..	Plain, 3 .	Ball ..	Ball ..	Ball ..	2,100
Disk....	Sel ...	Unit M .	3	Bevel...	Springs...	Float .	3.72-1	136	40x4½	40x4½	Wood	....	½ Ell..	½ Ell..	I-Beam .	Opt	Cent..	Cent..	Plain, 3 .	Ball ..	Ball ..	Ball ..	2,360
Disk....	Sel ...	Unit M .	4	Bevel...	Springs...	Float .	....	144	41x5	41x5	Wood	....	½ Ell..	½ Ell..	I-Beam .	Right...	Cent..	Cent..	Plain, 3 .	Ball ..	Ball ..	Ball ..	2,635
Disk....	Sel ...	Unit M .	3	Bevel...	....	Float .	3.50-1	118	36x4	36x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Left...	Cent..	Cent..	Plain, 3 .	Ball ..	Ball ..	Ball ..	....
Disk....	Sel ...	Unit M .	3	Bevel...	....	Float .	3.50-1	128	34x4	34x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Left...	Cent..	Cent..	Plain, 4 .	Ball ..	Ball ..	Ball ..	....
Disk....	Sel ...	Unit M .	3	Bevel...	....	Float .	3.50-1	126	36x4	36x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Left...	Cent..	Cent..	Plain, 4 .	Ball ..	Ball ..	Ball ..	....
Disk....	Sel ...	Unit M .	3	Bevel...	....	Float .	3.50-1	136	36x4	36x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Left...	Cent..	Cent..	Plain, 4 .	Ball ..	Ball ..	Ball ..	....
Disk....	Sel ...	Unit M .	3	Bevel...	Springs...	Float .	3.50-1	128	36x4	36x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Left...	Cent..	Cent..	Plain, 7 .	Ball ..	Ball ..	Ball ..	....
Disk....	Sel ...	Unit M .	3	Bevel...	Springs...	Float .	3.50-1	138	36x4	36x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Left...	Cent..	Cent..	Plain, 7 .	Ball ..	Ball ..	Ball ..	....
Cone ...	Sel ...	Unit M .	3	Bevel...	Springs...	Semi F	3.50-1	112	32x3½	32x3½	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 3 .	Ball ..	Roll ..	Ball ..	2,350
Cone ...	Sel ...	Unit M .	3	Bevel...	Springs...	Float .	4.00-1	116	34x4	34x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 3 .	Ball ..	Ball ..	Ball ..	3,350
Cone ...	Sel ...	Unit M .	3	Bevel...	Springs...	Float .	4.00-1	130	34x4½	34x4½	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 4 .	Ball ..	Ball ..	Ball ..	3,900
Cone ...	Sel ...	Unit M .	3	Bevel...	Tor T	Float .	3.75-1	135	36x4½	36x4½	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 4 .	Ball ..	Ball ..	Ball ..	3,700
Cone ...	Sel ...	Unit X .	3	Bevel...	Tor T	Semi F	3.50-1	116	36x4	36x4	Wood	....	½ Ell..	½ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 2 .	Roll ..	B&R .	Ball...	2,000
Cone ...	Sel ...	Amid ...	3	Bevel...	Tor T	Float .	....	112	32x3½	32x3½	Wood	....	½ Ell..	½ Ell..	I-Beam .	Right...	Right.	Right.	Ball, 4 .	Ball ..	....	Ball ..	2.400
Cone ...	Sel ...	Unit X .	3	Bevel...	S & T T ..	¾ Float	Opt.....	110	32x3½	32x3½	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Cent..	Cent..	Plain, 5 .	Ball ..	B&R..	Roll...	1,900
Cone ...	Sel ...	Unit X .	3	Bevel...	S & T T ..	Float .	Opt	114	34x4	34x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Cent..	Cent..	Plain, 5 .	Ball ..	Roll ..	Roll ..	2,100
Disk....	Sel ...	....	3	Bevel...	Tor T	Float .	3.50-1	121	34x4	34x4	Wood	....	....	....	I-Beam .	Right...	Right.	Right.	Plain, 3 .	Roll ..	Roll ..	Roll ..	2,700
Disk....	Pro ..	Unit X .	3	Bevel...	T & R R...	Semi F	3.80-1	115½	36x4½	37x5	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Left	Left ..	Left ..	Plain, 7 .	Ball ..	Ball ..	Roll ..	3,500
Disk....	Pro ..	Unit X .	3	Bevel...	T & R R...	Semi F	3.80-1	134	36x4½	37x5	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Left	Left ..	Left ..	Plain, 7 .	Ball ..	Ball ..	Roll ..	3,500
Disk....	Pro ..	Unit X .	3	Bevel...	T & R R...	Semi F	3.80-1	138	36x4½	37x5	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Left	Left ..	Left ..	Plain, 7 .	Ball ..	Ball ..	Roll ..	3,500
Disk....	Pro ..	Unit X .	3	Bevel...	T & R R ..	Semi F	3.80-1	121½	36x4½	37x5	Wood	....	½ Ell..	¾ Ell..	Tub	Right...	Right.	Right.	Plain, 4 .	Ball ..	Ball ..	Roll ..	4,050
Disk....	Pro ..	Unit X .	3.	Bevel...	T & R R...	Semi F	3.80-1	139	36x4½	37x5	Wood	....	½ Ell..	¾ Ell..	Tub	Right...	Right.	Right.	Plain, 4 .	Ball ..	Ball ..	Roll .	4,050
Disk....	Sel ...	Unit M .	3	Bevel...	Rad Rd...	Semi F	4.00-1	110	32x3½	32x3½	Wood	....	½ Ell..	Ell ...	I-Beam .	Right...	Right.	Right.	Plain, 2 .	B&R..	B&R..	Ball ..	2,180
Disk....	Sel ...	Unit M .	3	Bevel...	Rad Rd...	¾ Float	3.53-1	116	34x4	34x4	Wood	....	½ Ell..	Ell ...	I-Beam .	Left	Cent..	Cent..	Plain, 3 .	B&R..	B&R..	Ball ..	2,700
Disk....	Sel ...	Unit X .	3	Bevel...	Rad Rd...	Float .	3.69-1	127	36x4	36x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 3 .	Roll ..	B&R..	Ball ..	2,510
Disk....	Sel ...	Amid ...	4	Bevel...	Rad Rd...	Float .	3.30-1	138	36x4	36x5	Wood	....	½ Ell..	½ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 4 .	Ball ..	Ball ..	Roll ..	2,929
Cone ...	Sel ...	Unit M .	3	Bevel...	Springs...	Float .	4.00-1	116	34x4	34x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 3 .	Ball ..	Ball ..	Ball ..	2,700
Cone ...	Sel ...	Unit M .	3	Bevel...	Springs...	Float .	4.00-1	122	36x4	36x4	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 3 .	Ball ..	Ball ..	Ball ..	3,100
Cone ...	Sel ...	Unit M .	3	Bevel...	Tor T	Float .	Opt	120	36x4	36x4	Opt .	....	½ Ell..	½ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 3 .	Ball ..	Ball ..	Roll ..	2,300
Exp Bd .	Sel ...	Amid ...	4	Bevel...	Tor T	Float .	....	113	34x4½	34x4½	Wood	....	½ Ell..	Plat ..	I-Beam .	Left	Cent..	Cent..	Plain, 3 .	Ball ..	Ball ..	Roll ..	....
Exp Bd .	Sel ...	Amid ...	4	Bevel...	Rad Rd...	Float .	3.60-1	125	36x4½	36x4½	Wood	....	½ Ell..	Plat ..	I Beam .	Right...	Right.	Right.	Plain, 7 .	Ball ..	Ball ..	Roll ..	....
Exp Bd .	Sel ...	Amid ...	4	Bevel...	Rad Rd...	Float .	3.20-1	137	36x4½	37x5	Wood	....	½ Ell..	Plat ..	I-Beam .	Right...	Right.	Right.	Plain, 7 .	Ball ..	Ball ..	Roll ..	4,750
Exp Bd .	Sel ...	Amid ...	4	Bevel...	Rad Rd...	Float .	2.60-1	140	38x5½	38x5½	Wood	....	½ Ell..	Plat ..	I-Beam .	Right...	Right.	Right.	Plain, 7 .	Ball ..	Ball ..	Roll ..	....
Disk....	Sel ...	Unit M .	3	Bevel...	Rad Rd...	Semi F	....	106	32x3½	32x3½	Wood	....	Ell ...	Ell ...	I-Beam .	Right...	Cent..	......	Plain, 3 .	......	Ball ..	Ball ..	1,800
Cone ...	Sel ...	Amid ...	4	Bevel...	Springs...	Semi F	....	132	36x4½	36x4½	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 7 .	Ball ..	B&R..	Roll ..	3,030
Cone ...	Sel ...	Amid ...	4	Bevel...	Springs...	Semi F	....	134½	37x5	37x5	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 7 .	Ball ..	B&R..	Roll ..	3,335
Cone ...	Sel ...	Amid ...	4	Bevel...	Springs...	Semi F	....	142	37x5	37x5	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 7 .	Ball ..	B&R..	Roll ..	3,510
Cone ...	Sel ...	Amid ...	4	Bevel...	Springs ...	Semi F	....	147½	37x5	38x5½	Wood	....	½ Ell..	¾ Ell..	I-Beam .	Right...	Right.	Right.	Plain, 7 .	Ball ..	B&R..	Roll ..	3,980

ABREVIATIONS:—Clutch Type: Exp Bd, expanding band; Con Bd, contracting band. **Gearset:** Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; Unit M, unit with motor; Unit X, unit with rear axle; Amid, amidships. **Drive:** Bevel, shaft with bevel gear at rear axle; Worm, shaft with worm gear at rear axle. **Car Drives through:** Tor T, torsion tube; S & T T, springs and torsion tube; R & T R, radius rods and torsion rod; Rad Rd, radius rods; S & R R, springs and radius rods; Tor Rd, torsion rod. **Rear Axle:** Float, floating; Semi-F, semi-floating; ¾ Float, ¾ floating. **Wheel Attachment:** Dem, demountable. **Springs:** ½ Ell, semi-elliptic; Ell, elliptic; ¾-Ell, ¾ elliptic; Plat, platform. **Front Axle:** Tub, tubular. **Control Location Steering:** Cent, center. **Bearings:** Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller; B R & P, ball, roller and plain.

Passenger Car Chassis Listed for 1913

5

MAKE AND MODEL	No. of Cylinders	Bore and Stroke, Inches	S. A. E. H. P.	Piston Displacement Cubic Inches	CYLINDERS Shape	CYLINDERS How Cast	VALVES Type	VALVES Location	VALVES Camshaft Drive	COOLING Circulation	COOLING Radiator	LUBRICATION System	LUBRICATION Type of Pump	IGNITION System	IGNITION Magneto Generator	IGNITION Control	CARBURETION Make of Carbureter	CARBURETION Fuel Feed	ENGINE STARTER Type	ENGINE STARTER Make
Pilot, 50	4	4.50x6.00	32.40	381.7	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash		Dual	Opt	Hand	Optional	Grav	Elec	Gray & Da.
Pilot, 60	6	4.00x6.00	38.40	452.4	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash		Dual	Opt	Hand	Optional	Grav	Elec	Gray & Da.
Pope-Hartford, 31	4	4.32x5.13	30.90	299.9	Straight	Pairs	Poppet	Head	Gear	Pump	Tub	Spl-Pres	Piston	Dual		Hand	Own	Grav	Elec	Gray & Da.
Pope-Hartford, 33	4	4.75x5.50	36.10	389.9	Straight	Pairs	Poppet	Head	Gear	Pump	Tub	Spl-Pres	Piston	Dual	Bosch	Hand	Own	Grav	Elec	Gray & Da.
Pope-Hartford, 29	6	4.32x5.38	46.35	471.9	Straight	Pairs	Poppet	Head	Gear	Pump	Tub	Spl-Pres	Piston	Dual	Bosch	Hand	Own	Grav	Elec	Gray & Da.
Pratt, 30	4	4.00x4.50	25.60	226.2	L Head	Pairs	Poppet	Left	Gear	Thermo	Tub	Splash	Gear	Dual	Deaco	Hand	Schebler	Grav	Acet	Prestolite
Pratt, 40	4	4.50x4.75	32.40	302.2	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Schebler	Grav	Acet	Prestolite
Pratt, 50	4	4.50x5.75	32.40	365.8	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Schebler	Grav	Elec	Gray & Da.
Premier, 6-40	6	4.00x5.00	38.40	376.9	T Head	Threes	Poppet	Opp	Spi'l	Pump	Cell	Splash	Gear	Dual	Eisemann	Hand	Optional	Grav	Air	Own
Premier, 6-60	6	4.50x5.25	48.60	501.0	T Head	Pairs	Poppet	Opp	Spi'l	Pump	Cell	Splash	Gear	Dual	Eisemann	Hand	Carter	Grav	Air	Own
Pullman, 36	4	4.06x5.00	26.40	259.2	T Head	Pairs	Poppet	Opp	Hel'l	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Stromberg	Grav		
Pullman, 44	4	4.50x5.50	32.40	349.9	T Head	Pairs	Poppet	Opp	Hel'l	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Stromberg	Grav	Spring	Everready
Pullman, 66	6	4.50x5.50	48.60	523.5	T Head	Pairs	Poppet	Opp	Hel'l	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Stromberg	Grav	Spring	Everready
Rambler, Cross-Country	4	4.50x4.50	32.40	286.3	L Head	Sep'rt	Poppet	Right	Gear	Pump	Tub	Spl-Pres	Piston	Sing	U.S.L	Hand	Stromberg	Grav	Elec	U. S. L.
Rayfield, C	6	3.50x5.50	29.40	317.4	T Head	Pairs	Poppet	Opp	Chain	Thermo	Cell	Pressure		Sing	Mea	Hand	Rayfield	Pres		
R. C. H	4	3.25x5.00	16.90	165.9	L Head	Block	Poppet	Left	Gear	Thermo	Tub	Splash	Wheel	Sing	Bosch	Fixed	B. D	Grav		
Reeves, Sextoauto†	4	4.75x5.50	36.10	389.9	T Head		Poppet	Opp	Gear	Pump	Cell	Pressure		Dual	Eisemann	Hand	Optional	Grav		
Regal, T & N*	4	3.75x4.50	22.50	198.8	L Head	Block	Poppet	Left	Gear	Thermo	Tub	Spl-Pres	Piston	Dual	Michigan	Hand	Own	Grav		
Regal, Coupe*	4	3.75x4.50	22.50	198.8	L Head	Block	Poppet	Left	Gear	Thermo	Tub	Spl-Pres	Piston	Dual	Michigan	Hand	Own	Grav		
Regal, H*	4	4.25x4.50	28.90	255.3	L Head	Pairs	Poppet	Left	Gear	Thermo	Tub	Spl-Pres	Piston	Dual	Michigan	Hand	Own	Grav		
Regal, C	4	4.00x5.00	25.60	251.3	L Head	Block	Poppet	Left	Gear	Pump	Tub	Spl-Pres	Piston	Dual	Michigan	Hand	Schebler	Grav		
Reo, The Fifth	4	4.00x4.50	25.60	226.2	L Head	Pairs	Poppet	S&H	Gear	Pump	Tub	Spl-Pres	Piston	Dual	National	Hand	Holley	Grav	Acet	Own
Republic, D	4	4.25x5.00	28.90	283.6	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Delco	Hand	Stromberg	Grav		
Republic, E	6	4.25x5.00	43.35	425.4	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Delco	Hand	Stromberg	Pres	Elec	Delco
Richmond, O	4	4.00x4.50	25.60	251.3	L Head	Sep'rt	Poppet	Left	Gear	Thermo	Tub	Spl-Pres	Piston	Sing	Michigan	Hand	Schebler	Grav	Opt	Optional
Richmond, P	4	4.50x5.00	32.40	318.1	L Head	Sep'rt	Poppet	Left	Gear	Thermo	Tub	Spl-Pres	Piston	Sing	Michigan	Hand	Schebler	Grav	Elec	
Schacht, NS, KL	4	4.25x5.50	28.90	312.0	L Head	Block	Poppet	Right	Spi'l	Pump	Cell	Spl-Pres	Piston	Dual		Hand	Optional	Grav	Elec	
Schlosser	4	5.00x6.00	40.00	471.2	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Splash	Noncir	Dual	Bosch	Hand	G. & A	Pres		
Selden, 48	4	4.75x5.00	36.10	354.4	L Head	Pairs	Poppet	Left	Spir'l	Pump	Tub	Splash	Gear	Doub	Bosch	Hand	Stromberg	Grav	Acet	Disco.
S. G. V., A	4	3.75x4.38	22.50	193.3	L Head	Block	Poppet	Left	Gear	Pump	Cell	Pressure	Gear	Sing	Bosch	Fixed	Own	Pres		
S. G. V., D	4	4.00x5.25	25.60	263.9	L Head	Block	Poppet	Left	Gear	Pump	Cell	Pressure	Gear	Sing	Bosch	Hand	Own	Pres		
Simplex, 127	4	4.88x6.50	38.00	485.3	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Noncir	Dual	Bosch	Hand	Own	Pres	Acet	Disco
Simplex, 137	4	4.88x6.50	38.00	485.3	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Noncir	Dual	Bosch	Hand	Own	Pres	Acet	Disco.
Simplex, 129	4	5.75x5.75	53.00	597.2	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Noncir	Dual	Bosch	Hand	Own	Pres	Acet	Disco
Simplex, 139	4	5.75x5.75	53.00	597.2	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Spl-Pres	Noncir	Dual	Bosch	Hand	Own	Pres	Acet	Disco.
Spaulding, G	4	4.25x5.50	28.90	312.0	L Head	Block	Poppet	Right	Gear	Pump	Cell	Splash	Piston	Dual	Eisemann	Hand	Schebler	Grav	Elec	Gray & Da.
Speedwell, G	6	4.13x5.25	40.90	420.9	L Head	Threes	Poppet	Left	Hel'l	Pump	Cell	Splash	Piston	Dual	Bosch	Hand	Schebler	Pres	Elec	Aplco
Spoerer, 40-C	4	4.88x5.50	38.00	410.6	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand		Grav	Elec	Berdon
Spoerer, 25-A	4	4.13x5.50	27.25	294.0	L Head	Pairs	Poppet	Left	Gear	Pump	Cell	Pressure	Gear	Dual	Bosch	Hand		Grav	Elec	Berdon
Staver, 45	4	4.50x5.00	32.40	318.1	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Remy	Hand	Schebler	Grav	Air	Own
Staver, 45	4	4.50x5.00	32.40	318.1	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Remy	Hand	Schebler	Pres	Air	Own
Staver, 55	4	4.50x6.00	32.40	381.7	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Remy	Hand	Schebler	Grav	Air	Own
Staver, 55	4	4.50x6.00	32.40	381.7	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Remy	Hand	Schebler	Pres	Air	Own
Staver, 65	6	4.00x6.00	38.40	452.4	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Remy	Hand	Rayfield	Pres	Air	Own
Stearns, Knight, 4	4	4.25x5.50	28.90	312.0	Knight	Pairs	Sleeve	Opp	Chain	Pump	Cell	Spl-Pres	Gear	Dual	Mea	Hand	Stromberg	Pres	Spring	Everready
Stearns, Knight, 4 Road	4	4.25x5.50	28.90	312.0	Knight	Pairs	Sleeve	Opp	Chain	Pump	Cell	Spl-Pres	Gear	Dual	Mea	Hand	Stromberg	Pres	Spring	Everready
Stearns, Knight, Light Tour.	4	4.25x5.50	28.90	312.0	Knight	Pairs	Sleeve	Opp	Chain	Pump	Cell	Spl-Pres	Gear	Dual	Mea	Hand	Stromberg	Pres	Spring	Everready
Stearns, Knight, 6 Road	6	4.25x5.75	43.80	489.4	Knight	Pairs	Sleeve	Opp	Chain	Pump	Cell	Spl-Pres	Gear	Dual	Mea	Hand	Stromberg	Pres	Elec	Gray & Da.
Stearns, Knight, 6	6	4.25x5.75	43.80	489.4	Knight	Pairs	Sleeve	Opp	Chain	Pump	Cell	Spl-Pres	Gear	Dual	Mea	Hand	Stromberg	Pres	Elec	Gray & Da.
Stevens-Duryea, C	6	4.32x5.50	46.33	481.9	L Head	Pairs	Poppet	Left	Hel'l	Pump	Cell	Spl-Pres		Doub	Bosch	Hand	Own	Grav	Acet	Disco
Stevens-Duryea	6	4.32x5.50	46.33	481.9	L Head	Pairs	Poppet	Left	Hel'l	Pump	Cell	Spl-Pres		Doub	Bosch	Hand	Own	Grav	Acet	Disco
Stoddard-Day, 30	4	4.00x4.50	25.60	226.2	L Head	Block	Poppet	Right	Gear	Thermo	Cell	Splash	Piston	Dual	Spld'rf	Hand	Stromberg	Grav	Acet	Own
Stoddard-Day, 38	4	4.25x5.13	28.90	290.7	L Head	Block	Poppet	Left	Gear	Pump	Cell	Splash	Piston	Dual	Bosch	Hand	Stromberg	Grav	Acet	Own
Stoddard-Day, 48	4	4.75x5.00	36.10	354.4	Straight	Pairs	Poppet	S&H	Gear	Pump	Cell	Spl-Pres	Gear	Doub	Bosch	Hand	Stromberg	Pres.		
Stoddard-Day, Knight	6	4.50x5.50	48.60	524.8	Knight	Threes	Sleeve	Opp	Chain	Pump	Cell	Splash	Gear	Doub	Bosch	Hand	Stromberg	Pres		
Studebaker, 20	4	3.62x3.75	20.30	154.8	L Head	Block	Poppet	Left	Gear	Pump	Tub	Splash	Gear	Dual	Spld'rf	Hand	Own	Grav		
Studebaker, 25	4	3.50x5.00	19.60	192.4	L Head	Block	Poppet	Left	Spi'l	Pump	Tub	Splash	Gear	Dual	Spld'rf	Hand	Own	Grav	Acet	
Studebaker, 30	4	4.00x4.50	25.60	226.2	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Splash	Gear	Dual	Spld'rf	Hand	Own	Grav		
Studebaker, 35	4	4.13x5.00	27.25	267.3	L Head	Block	Poppet	Left	Spi'l	Pump	Tub	Splash	Gear	Dual	Spld'rf	Hand	Own	Grav	Elec	Wagner
Studebaker, Six	6	3.50x5.00	29.40	288.6	L Head	Block	Poppet	Left	Spi'l	Pump	Tub	Splash	Gear	Dual	Spld'rf	Hand	Own	Grav	Elec	Wagner
Stutz, 4 Bearcat	4	4.75x5.50	36.10	389.9	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Eisemann	Hand	Optional	Grav		
Stutz, 4 Tour	4	4.75x5.50	36.10	389.9	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Eisemann	Hand	Optional	Grav		
Stutz, 6 Bearcat	6	4.25x5.00	43.80	425.4	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Doub	Spld'rf	Hand	Stromberg	Grav		
Stutz, 6 Touring	6	4.25x5.00	43.80	425.4	T Head	Pairs	Poppet	Opp	Gear	Pump	Cell	Pressure	Gear	Dual	Eisemann	Hand	Stromberg	Grav		
Touraine, Race	6	4.00x5.25	38.40	395.8	T Head	Threes	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Fletcher	Pres		
Touraine, 6	6	4.00x5.25	38.40	395.8	T Head	Threes	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Fletcher	Pres		
Touraine, 7	6	4.00x5.25	38.40	395.8	T Head	Threes	Poppet	Opp	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Fletcher	Pres		
Triumph, A&B	4	4.75x5.50	36.10	389.9	L Head	Block	Poppet	Left	Gear	Pump	Tub	Splash	Gear	Dual	Bosch	Hand	Stromberg	Grav	Air	Own
Velie, Dispatch	4	3.75x5.50	22.50	231.1	L Head	Block	Poppet	Left	Chain	Thermo	Tub	Splash	Piston	Dual	Bosch	Hand	Stromberg	Grav	Elec	Gray & Da.

*Underslung Frame. †Has six wheels.

ABBREVIATIONS:—Model: Tour, touring; Road, roadster. **Cylinders:** Sep'rt, separate; **Valve Location:** Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. **Camshaft Drive:** Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. **Cooling Circulation:** Thermo, thermo-syphon. **Radiator:** Cell, cellular; Tub, tubular. **Lubrication:** Spl-Pres, combined splash and pressure system in circulating unless called Noncir. **Ignition:** Sing, single; Doub, double; Dual 2, double distributer; Gov, governor; Atw Kent, Atwater Kent. **Fuel Feed:** Grav, gravity; Pres, pressure. **Engine Starter:** Spr, spring; Elec, electric; Acet, acetlyene; Mech, mechanical; Opt, optional; Air, compressed air. **Bore and Stroke:** In decimals to nearest 1-100 inch, as 4.25=4¼, etc., .06=$\frac{1}{16}$, .19=$\frac{3}{16}$, .13=⅛, .25=¼, .31=$\frac{5}{16}$, .38=⅜, .44=$\frac{7}{16}$, .5=½, .56=$\frac{9}{16}$, .63=⅝, .69=$\frac{11}{16}$, .75=¾, .81=$\frac{13}{16}$, .88=⅞.

Horsepower and Mechanical Details

	TRANSMISSION							RUNNING GEAR								CONTROL			BEARINGS				5
Clutch Type	GEARSET			Drive	Car Drives Through	Rear Axle	Total Gear Ratio on High	Wheelbase	TIRES		WHEELS		SPRINGS		Front Axle	Location Steering Wheel	Gearshift Location	Emergency Brake Control	Crank-shaft Type and No.	Gearset	Rear Axle	Front Wheel	Chassis Weight, Lbs.
	Type	Location	Forward Speeds						Front	Rear	Kind	Attach-ment	Front	Rear									
Cone	Sel	Amid	3	Bevel	Springs	Float	3.50-1	126	36x4	36x4	Wood	....	½ Ell	½ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Ball	Ball	Ball	2,400
Cone	Sel	Amid	3	Bevel	Springs	Float	3.50-1	132	37x4½	37x4½	Wood	....	½ Ell	½ Ell	I-Beam	Right	Cent	Cent	Plain, 4	Ball	Ball	Ball	2,600
Cone	Sel	Amid.	4	Bevel	Springs	Float	....	118½	38x4½	36x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	....
Cone	Sel	Amid	4	Bevel	Rad Rd	Float	....	124	36x4½	36x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Plain	Roll	Roll	....
Cone	Sel	Amid	4	Bevel	Rad Rd	Float	....	133	37x5	37x5	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 4	Roll	Roll	Roll	....
Disk	Sel	....	3	Bevel	Rad Rd	¾Float	....	114	34x3½	34x3½	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Roll	Roll	Ball	....
Cone	Sel	....	3	Bevel	Rad Rd	Float	....	120	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	....
Disk	Sel	....	3	Bevel	Springs	Float	....	122	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	....
Disk	Sel	Amid	3	Bevel	S & T R	Semi F	....	132	36x4½	36x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	B&R	Roll	3,000
Disk	Sel	Amid	3	Bevel	S & T R	Semi F	....	139	37x5	37x5	Wood	....	½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 4	Ball	B&R	Roll	3,200
Cone	Sel	Amid	3	Bevel	Springs	Float	....	118	34x4	34x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	....
Cone	Sel	Amid	4	Bevel	Springs	Float	....	122	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Roll	....
Cone	Sel	Amid	4	Bevel	Springs	Float	....	138	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 4	Ball	Roll	Roll	....
Cone	Sel	Amid	3	Bevel	Rad Rd	Semi F	3.71-1	120	36x4	36x4	Wood	Dem	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	2,700
Disk	Sel	Unit M	3	Bevel	Rad Rd	Float	3.44-1	117	34x4	34x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 4	Ball	Ball	Ball	....
Cone	Sel	Unit X	3	Bevel	Tor T	Semi F	4.25-1	110	32x3½	32x3½	Wood	....	½ Ell	Ell	I-Beam	Left	Cent	Cent	Plain, 2	P&R	B&R	Ball	1,300
Disk	Sel	Unit X	3	Bevel	Tor T	Float	....	158	34x4½	34x4½	Wood	....	½ Ell	½ Ell	I-Beam	Right	Right	Right	....	Ball	Roll	Roll	....
Cone	Sel	Unit X	3	Bevel	Rad Rd	Semi F	3.70-1	108	32x3½	32x3½	Wood	....	½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 2	Roll	Roll	Ball	2,000
Cone	Sel	Unit X	3	Bevel	Rad Rd	Semi F	4.00-1	100	32x3½	32x3½	Wood	....	½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 2	Roll	Roll	Ball	2,365
Cone	Sel	Unit X	3	Bevel	Rad Rd	Semi F	3.50-1	118	34x4	34x4	Wood	....	½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Ball	2,650
Cone	Sel	Unit X	3	Bevel	Rad Rd	Semi F	4.00-1	116	34x4	34x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Ball	....
Disk	Sel	Amid	3	Bevel	Springs	Semi F	3.75-1	......	34x4	34x4	Wood	....	....	....	I-Beam	Left	Cent	Cent	Plain, 3	Roll	Roll	Roll	2,700
Cone	Sel	Unit X	3	Bevel	Rad Rd	Float	3.50-1	120	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 3	Ball	Ball	Ball	2,800
Cone	Sel	Amid	4	Bevel	Springs	Float	3.00-1	132	36x4½	36x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Left	Cent	Pedal	Plain, 5	Ball	Ball	Ball	3,300
Cone	Sel	Amid	3	Bevel	S & T T	Semi F	3.20-1	112	34x3½	34x3½	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 5	Ball	B&R	Ball	....
Cone	Sel	Amid	3	Bevel	S & T T	Semi F	3.20-1	120	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 5	Ball	B&R	Ball	....
Cone	Sel	Amid	3	Bevel	Springs	Float	....	120	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	B&R	Ball	....
Disk	Sel	Amid	4	Bevel	Rad Rd	Float	....	124	36x4½	36x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	3,000
Disk	Sel	Amid	3	Bevel	Springs	Float	3.50-1	125	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	B&R	Ball	2,370
Disk	Sel	Amid	4	Bevel	Springs	Semi F	....	116	34x4	34x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,400
Disk	Sel	Amid	4	Bevel	Springs	Semi F	....	118	35x4½	35x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,600
Disk	Sel	Amid	4	Bevel	Tor T	Semi F	2.75-1	127	35x5	35x5	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,800
Disk	Sel	Amid	4	Bevel	Tor T	Semi F	2.75-1	137	35x5	35x5	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,825
Disk	Sel	Amid	4	Chain	Rad Rd	Dead	2.13-1	129	36x4	36x5	Wood	....	½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,910
Disk	Sel	Amid	4	Chain	Rad Rd	Dead	2.13-1	139	36x5	36x5	Wood	....	½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,925
Cone	Sel	Amid	3	Bevel	Springs	Float	....	120	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Roll	Roll	Roll	....
Disk	Sel	Unit M	3	Bevel	Springs	Float	3.00-1	134	36x4½	36x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Roll	Roll	3,490
Cone	Sel	Amid	3	Bevel	Rad Rd	Float	....	120	37x4½	37x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Roll	Roll	....
Cone	Sel	Unit X	3	Bevel	Tor T	Semi F	....	120	35x4	35x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	B&R	Ball	2,300
Disk	Sel	Amid	3	Bevel	Rad Rd	Float	3.50-1	113	34x4	34x4	Wood	....	½ Ell	Ell	Tube	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,250
Disk	Sel	Amid	3	Bevel	Springs	Float	3.50-1	116	34x4	34x4	Wood	....	½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Ball	Ball	Ball	2,300
Disk	Sel	Amid	3	Bevel	Springs	Float	3.50-1	120	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,575
Disk	Sel	Amid	3	Bevel	Springs	Float	3.50-1	124	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,600
Disk	Sel	Amid	4	Bevel	Springs	Float	3.50-1	136	37x4½	37x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 5	Ball	Ball	Ball	2,950
Disk	Sel	Unit X	3	Bevel	Tor T	Float	3.90-1	127	36x4½	36x4½	Wood	....	½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 5	Ball	Roll	Roll	3,200
Disk	Sel	Unit X	3	Bevel	Tor T	Float	3.90-1	116	36x4½	36x4½	Wood	....	½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 5	Ball	Roll	Roll	3,200
Disk	Sel	Unit X	3	Bevel	Tor T	Float	3.90-1	121	36x4½	36x4½	Wood	....	½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 5	Ball	Roll	Roll	3,200
Disk	Sel	Unit X	4	Bevel	Springs	Float	3.40-1	134	37x5	37x5	Wood	....	½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 7	Ball	Roll	Roll	3,500
Disk	Sel	Unit M	4	Bevel	Springs	Float	3.40-1	140	37x5	37x5	Wood	....	½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 7	Ball	Roll	Roll	3,500
Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.70-1	131	37x4½	37x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 4	B&P	Ball	Ball	....
Disk	Sel	Unit M	3	Bevel	Tor T	Float	3.70-1	138	37x4½	37x5	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 4	B&P	Ball	Ball	....
Cone	Sel	Unit X	3	Bevel	Rad Rd	Semi F	4.00-1	112	34x4	34x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 2	Roll	Roll	Roll	2,600
Cone	Sel	Unit X	3	Bevel	Rad Rd	Float	3.53-1	114	35x4½	35x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Roll	3,300
Cone	Sel	Amid	3	Bevel	Rad Rd	Float	3.30-1	122½	36x4½	36x4½	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	B&R	Roll	3,700
Cone	Sel	Amid	3	Bevel	Rad Rd	Float	3.50-1	133	36x5	36x5	Wood	....	½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 7	Ball	B&R	Roll	4,400
Cone	Sel	Unit X	3	Bevel	Tor T	Semi F	....	102	32x3	32x3	Wood	....	½ Ell	Ell	I-Beam	Right	Right	Right	Plain, 2	B&R	Roll	Ball	....
Cone	Sel	Unit X	3	Bevel	Tor T	Semi F	3.58-1	101	30x3½	30x3½	Wood	....	½ Ell	Ell	I-Beam	Right	Right	Right	Plain, 3	BR&P	Roll	Ball	....
Cone	Sel	Unit X	3	Bevel	Tor T	Semi F	3.58-1	112	32x3½	32x3½	Wood	....	½ Ell	Ell	I-Beam	Right	Right	Right	Plain, 3	B&R	Roll	Ball	....
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.58-1	115½	34x4	34x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	BR&P	B&R	Ball	....
Cone	Sel	Unit X	3	Bevel	Tor T	Float	3.58-1	121	34x4	34x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	BR&P	B&R	Ball	....
Disk	Sel	Unit X	3	Bevel	Tor T	Semi F	Opt	120	34x4½	34x4½	Wood	....	½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	B&R	Roll	2,400
Disk	Sel	Unit X	3	Bevel	Tor T	Semi F	Opt	124	34x4½	34x4½	Wood	....	½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	B&R	Roll	2,400
Disk	Sel	Unit X	3	Bevel	Tor T	Semi F	Opt	124	34x4½	34x4½	Wood	....	½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	B&R	Roll	2,500
Disk	Sel	Unit X	3	Bevel	Tor T	Semi F	Opt	130	34x4½	34x4½	Wood	....	½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	B&R	Roll	2,500
Disk	Sel	....	3	Bevel	Tor T	Float	....	114	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	3,200
Disk	Sel	....	3	Bevel	Tor T	Float	....	124	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	3,200
Disk	Sel	....	3	Bevel	Tor T	Float	....	133	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	3,200
Cone	Sel	Amid	3	Bevel	Tor T	Float	3.33-1	114	36x4	36x4	Wood	....	½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Ball	Ball	Ball	2,800
Disk	Sel	Unit X	3	Bevel	Springs	Semi F	....	113	34x4	34x4	Wood	....	½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	B&P	Roll	Ball	2,150

ABBREVIATIONS:—Clutch Type: Exp Bd, expanding band; Con Bd, contracting band. **Gearset:** Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; Unit M, unit with motor; Unit X, unit with rear axle; Amid, amidships. **Drive:** Bevel, shaft with bevel gear at rear axle; Worm, shaft with worm gear at rear axle. **Car Drives through:** Tor T, torsion tube; S & T T, springs and torsion tube; R & T R, radius rods and torsion rod; Rad Rd, radius rods; S & R R, springs and radius rods; Tor Rd, torsion rod. **Rear Axle:** Float, floating; Semi-F, semi-floating; ¾ Float, ¾ floating. **Wheel Attachment:** Dem, demountable. **Springs:** ½ Ell; semi-elliptic; Ell, elliptic; ¾-Ell, ¾ elliptic; Plat, platform. **Front Axle:** Tub, tubular. **Control Location Steering:** Cent, center. **Bearings:** Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller; B R & P, ball, roller and plain.

Passenger Car Chassis Listed for 1913

6					CYLINDERS		VALVES			COOLING		LUBRICATION		IGNITION			CARBURETION		ENGINE STARTER	
NAME AND MODEL	No. of Cylinders	Bore and Stroke, Inches	S. A. E. H. P.	Piston Displacement Cubic Inches	Shape	How Cast	Type	Location	Camshaft Drive	Circulation	Radiator	System	Type of Pump	System	Magneto Generator	Control	Make of Carbureter	Fuel Feed	Type	Make
Velie, 32	4	3.75x5.50	22.50	231.1	L Head	Block	Poppet	Left	Chain	Thermo	Tub	Splash	Piston	Dual	Spld'rf	Hand	Stromberg	Grav		
Velie, 40	4	4.50x5.25	32.40	334.0	L Head	Pairs	Poppet	Left	Chain	Thermo	Tub	Splash	Piston	Dual	Bosch	Hand	Stromberg	Pres	Elec	Gray & Da.
Warren, Wolverine	4	4.13x4.50	27.25	240.5	L Head	Block	Poppet	Right	Gear	Pump	Cell	Splash	Gear	Doub	Bosch	Hand	Stromberg	Grav		
Warren, Pilgrim	4	4.25x4.75	28.90	269.4	L Head	Block	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Stromberg	Opt		
Warren, Resolute	6	4.00x5.00	38.40	376.9	L Head	Block	Poppet	Left	Gear	Pump	Cell	Splash	Gear	Dual	Bosch	Hand	Stromberg	Pres	Elec	Northeast
Westcott, 40	4	4.50x5.00	32.40	318.1	L Head	Sep'rt	Poppet	Left	Gear	Pump	Cell	Spl-Pres	Gear	Sing	Connectic't		Schebler	Grav	Elec	Electro
Westcott, 50	6	4.00x6.00	38.40	452.4	T Head	Block	Poppet	Opp	Gear	Pump	Cell	Splash		Sing	Electro			Grav	Elec	Electro
White, GRE	4	3.75x5.13	22.50	226.4	L Head	Block	Poppet	Right	Gear	Pump	Cell	Spl-Pres	Noncir	Sing	Mea	Hand	Own	Grav	Elec	Own
White, GEB	4	4.25x5.75	28.90	326.3	L Head	Block	Poppet	Right	Gear	Pump	Cell	Spl-Pres	Noncir	Sing	Mea	Hand	Own	Grav	Elec	Own
White, GF	6	4.25x5.75	43.80	489.4	L Head	Block	Poppet	Right	Gear	Pump	Cell	Spl-Pres	Noncir	Sing	Mea	Hand	Own	Grav	Elec	Own
Winton, 17D	6	4.50x5.00	48.60	477.2	L Head	Pairs	Poppet	Right	Gear	Pump	Cell	Splash	Piston	Dual	Bosch	Hand	Stromberg	Grav	Air	Own
Zimmerman, Z-40	4	4.32x5.00	30.25	292.1	L Head	Pairs	Poppet	Left	Gear	Thermo	Cell	Spl-Pres	Gear	Dual		Fixed	Schebler	Grav		
Zimmerman, Z-6	6	3.75x5.00	33.75	331.4	L Head	Pairs	Poppet	Left	Gear	Pump	Tub	Spl-Pres	Gear	Sing	Deaco	Hand	Schebler	Pres		

*Underslung Frame. †Has six wheels.

ABBREVIATIONS:—Model: Tour, touring; Road, roadster. **Cylinders:** Sep'rt, separate; **Valve Location:** Opp, valves on opposite sides of cylinder; Head, both valves in head; L & H, left side and in head; R & H, right side and in head. **Camshaft Drive:** Gear, spur gears; Hel'l, helical gears; Spi'l, spiral gears. **Cooling Circulation:** Thermo, thermo-syphon. **Radiator:** Cell, cellular; Tub, tubular. **Lubrication:** Spl-Pres, combined splash and pressure system in circulating unless called Noncir. **Ignition:** Sing, single; Doub, double; Dual 2, double distributer; Gov, governor; Atw Kent, Atwater Kent. **Fuel Feed:** Grav, gravity; Pres, pressure. **Engine Starter:** Spr, spring; Elec, electric; Acet, acetlyene; Mech, mechanical; Opt, optional ; Air, compressed air. **Bore and Stroke:** In decimals to nearest 1-100 inch, as 4.25=4¼, etc., .06=1/16, .19=3/16, .13=1/8, .25=1/4, .31=5/16, .38=3/8, .44=7/16, .5=1/2, .56=9/16, .63=5/8, .69=11/16, .75=3/4, .81=13/16, .88=7/8.

Adams-Farwell, horsepower should be 60.50 instead of 60.00. Alpena, P-40, piston displacement should be 231.9 instead of 272.1.

Sizes of Motors of Twenty Concerns for the Past 3 Years

Name and Model	1913				1912				1911			
	umber Cylin-der	Bore	Stroke	P.D.	Model	Bore	Stroke	P.D.	Model	Bore	Stroke	P.D.
Pierce Arrow 66A	6	5.	7.	824.8	66T	5.	7.	824.8	66T	5.25	5.50	714.3
Peerless 29	4	4.	4.63	232.5	D	4.	4.63	232.5	29	4.	4.63	232.5
Peerless 35	6	4.	5.50	414.8	J	4.	5.50	414.8				
Peerless 38	6	4.50	6.	572.5	K	4.50	6.	572.5				
Peerless 37	6	5.	7.	824.8	L	5.	7.	824.8	32	5.	5.50	647.9
	4				H	5.	5.50	431.9	31	5.	5.50	431.9
Packard 38	6	4.	5.50	414.8								
Packard 48	6	4.50	5.50	524.8	6	4.50	5.50	524.8				
	4				30	5.	6.	471.2	30	5.	6.	471.2
	4				18	4.06	5.13	265.7	18	4.06	5.13	265.7
Locomobile L	4	4.50	4.50	286.3	L4	4.50	4.50	286.3	L	4.50	4.50	286.3
Locomobile R	6	4.25	5.	425.4								
Locomobile M	6	4.50	5.50	524.8	M2	4.50	4.50	429.5	M	4.50	4.50	429.5
Premier 6.40	6	4.	5.	376.9								
Premier 6.60	6	4.50	5.25	501.0	M6	4.50	5.25	501.0	6–60	4.50	5.25	501.0
	4				M4	4.50	5.25	334.0	4–40	4.50	5.25	334.0
Lozier 77	6	3.63	5.50	340.7								
Lozier 72	6	4.63	5.50	554.4	51	4.63	5.50	554.4	51	4.63	5.50	554.4
	4				46	5.38	6.	544.6	46	5.38	6.	544.6
Marmon 32	4	4.50	5.	318.1	32	4.50	5.	318.1	32	4.50	5.	318.1
Marmon Six	6	4.50	6.	572.5								
Cadillac 1913	4	4.50	5.75	365.8	1912	4.50	4.50	286.3	Thirty	4.50	4.50	286.3
Chalmers 17	4	4.25	5.25	297.8	36	4.25	5.25	297.8				
Chalmers 18	6	4.25	5.25	446.7	12	4.25	5.25	446.7				
	4				30	4.	4.50	226.2	30	4.	4.75	238.8
Cole 40	4	4.13	4.75	253.9	1912							
Cole 50	4	4.50	5.25	334.0		4.50	5.25	334.0	30	4.25	4.50	255.3
Cole 60	6	4.13	4.75	380.8								

Tendencies in Regard to Piston Displacement Among the American Automobile Manufacturers for 1913

Looking back over the last 3 years, there is a decided trend on the part of manufacturers who continue the same model over this period, to increase the amount of the piston displacement. This is graphically shown in Fig. —. With the exception of a few cases where the piston displacement has remained the same, this table shows that it is general practice to make the same model for 2 years and then to increase the motor size, or to have increased the size in 1912 over that of 1911 and leaving the 1913 models the same as 1912.

In many cases this increase can be directly traced to the practice now prevalent in lengthening the stroke. An example of this can be found by referring to the table on page — wherein comparisons of twenty various makes of cars are shown in their different models for the last 2 years, including 1913. The Model 32 Peerless in 1911 had a bore and stroke of 5 and 5.5-inches respectively giving a piston displacement of 647.9 cubic inches. In 1912 the stroke was increased to 7 inches, leaving the bore at 5 inches. This increase in stroke gives 174.9 cubic inches more piston displacement and this size is being continued for 1913, the total piston displacement of the engine with the increased stroke being 824.8 cubic inches.

Another example is the 1913 Cadillac, in which the stroke of the motor has been increased from 4.50 inches to 5.75 inces, the bore remaining 4.50-inches as heretofore. This increase of 1.5 inches in the stroke corresponds to an increase of 79.5 cubic inches piston displacement.

In drawing comparisons among the various models, the question of bore has been the main point upon which the similarity between the model of one

Horsepower and Mechanical Details

TRANSMISSION								RUNNING GEAR								CONTROL			BEARINGS				
	GEARSET								TIRES		WHEELS		SPRINGS										
Clutch Type	Type	Location	Forward Speeds	Drive	Car Drives Through	Rear Axle	Total Gear Ratio on High	Wheelbase	Front	Rear	Kind	Attachment	Front	Rear	Front Axle	Location Steering Wheel	Gearshift Location	Emergency Brake Control	Crankshaft Type and No.	Gearset	Rear Axle	Front Wheel	Chassis Weight, Lbs.
Cone	Sel	Unit X	3	Bevel	Springs	Semi F		113	34x3½	34x3½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	B&P	Roll	Ball	2,000
Disk	Sel	Amid	3	Bevel	S & T T	Float		118	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Cent	Plain, 3	Roll	Roll	Roll	2,550
Cone	Sel	Amid	3	Bevel	Springs	Semi F	3.75-1	110	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Ball	2,200
Cone	Sel	Amid	3	Bevel	Tor T	Float	4.00-1	115	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Ball	2,350
Cone	Sel	Amid	3	Bevel	Tor T	Float	3.75-1	130	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 3	Roll	Roll	Ball	2,900
Cone	Sel	Amid	3	Bevel	Springs	Float	3.80-1	120	36x4	36x4			½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 5	Ball	Roll	Roll	3,000
Cone	Sel	Amid	3	Bevel	Springs	Float	3.66-1	127	37x4½	37x4½			½ Ell	½ Ell	I-Beam	Right	Right	Right	Plain, 4	Blal	Roll	Roll	3,500
Cone	Sel	Amid	4	Bevel	S & R R	Semi F		110	34x4	34x4	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Left	Ball, 2	Ball	Ball	Ball	2,750
Cone	Sel	Amid	4	Bevel	S & R R	Semi F		120	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Left	Ball, 2	Ball	Ball	Ball	3,700
Cone	Sel	Amid	4	Bevel	S & R R	Semi F		132	37x5	37x5	Wood		½ Ell	¾ Ell	I-Beam	Left	Cent	Left	P&R, 3	Ball	Ball	Ball	4,500
Disk	Sel	Amid	4	Shaft	Rad Rd	Float	2.73-1	130	36x4½	36x4½	Wood		½ Ell	¾ Ell	I-Beam	Right	Right	Right	Plain, 4	Ball	Roll	Roll	
Cone	Sel	Amid	3	Shaft	Rad Rd	Semi F		116	35x4	35x4	Wood		½ Ell	Ell	I-Beam	Right	Cent	Cent	Plain, 3	Roll	Roll	Ball	1,750
Disk	Sel	Unit M	3	Shaft	Rad Rd	Float		128	36x4	36x4	Wood		½ Ell	¾ Ell	I-Beam	Right	Cent	Cent	Plain, 4	Ball	Ball	Ball	2,850

ABBREVIATIONS:—Clutch Type: Exp Bd, expanding band; Con Bd, contracting band. **Gearset:** Sel, selective; Pro, progressive; Plan, planetary; Fric, friction; Unit M, unit with motor; Unit X, unit with rear axle; Amid, amidships. **Drive:** Bevel, shaft with bevel gear at rear axle; Worm, shaft with worm gear at rear axle. **Car Drives through:** Tor T, torsion tube; S & T T, springs and torsion tube; R & T R, radius rods and torsion rod; Rad Rd, radius rods; S & R R, springs and radius rods; Tor Rd, torsion rod. **Rear Axle:** Float, floating; Semi-F, semi-floating; ¾ Float, ¾ floating. **Wheel Attachment:** Dem, demountable. **Springs:** ½ Ell; semi-elliptic; Ell, elliptic; ¾-Ell, ¾ elliptic; Plat, platform. **Front Axle:** Tub, tubular. **Control Location Steering:** Cent, center. **Bearings:** Roll, roller; B & R, ball and roller; B & P, ball and plain; P & R, plain and roller; B R & P, ball, roller and plain.

Garford G-15, piston displacement should be 446.7 instead of 497.5. Henderson, piston displacement should be 280.6 instead of 220.9.

Sizes of Motors of Twenty Concerns for the Past 3 Years

Name and Model	1913				1912				1911			
	Number Cylinders	Bore	Stroke	P.D.	Model	Bore	Stroke	P.D.	Model	Bore	Stroke	P.D.
Franklin G	4	4.	4.	201.1	25	4.	4.	201.1	M	4.	4.	201.1
Franklin M	6	3.63	4.	247.7	M	3.63	4.	247.6				
Franklin H	6	4.	4.	301.7	H	4.	4.	301.7	D	4.	4.	301.7
	4				G	3.38	4.	143.1	G	4.	3.38	169.7
Hudson 37	4	4.13	5.25	280.6	33	4.	4.50	226.2	33	4.	4.50	226.2
Hudson 54	6	4.13	5.50	441.0								
Winter 17D	6	4.50	5.	477.2	17C	4.50	5.	477.2	Six	4.50	5.	477.2
White GRE	4	3.75	5.13	226.4	GAD	3.75	5.13	226.4	GA	3.75	5.13	226.4
White GEB	4	4.25	5.75	326.3	GE	4.75	5.13	363.3				
White GF	6	4.25	5.75	489.4								
Stearns Knight 4	4	4.25	5.50	312.0		4.25	5.50	312.0				
Stearns Knight 6	6	4.25	5.75	480.4								
Rambler Cross Country	4	4.50	4.50	286.3		4.50	4.50	286.3	55	4.50	4.50	286.3
						5.	5.50	431.9	64	5.	5.50	431.9
Hupmobile C	4	3.25	3.38	112.0		3.25	3.38	112.0		3.25	3.38	112.0
Hupmobile H	4	3.25	5.50	182.5								
Jackson Olympic	4	4.13	4.75	253.9	32	4.	4.	201.1	30	4.	4.	201.1
Jackson Majestic	4	4.50	5.25	334.0	42	4.50	4.50	286.3	41	4.50	4.50	286.3
Jackson Sultanic	6	4.13	4.75	380.8								
	4				52	4.75	4.75	336.7	51	4.75	4.75	336.7
	4											
	4											
Haynes	4				20	4.25	5.	283.6	20	4.25	5.	283.6
	4				Y	5.	5.50	431.9	Y	5.	5.50	431.9
Haynes 22	4	4.50	5.50	349.9	21	4.50	5.50	349.9				
Pierce Arrow 38C	6	4.	5.50	414.8	36T	4.	5.13	395.8	36T	4.	5.13	395.8
Pierce Arrow 48B	6	4.50	5.50	524.8	48T	4.50	5.50	524.8	48T	4.50	5.50	524.8

Together with a Brief Résumé of the Changes Made by the Various Companies for the New Season

year and that of another have been compared, as this shows how the models of the same rated horsepower have varied over the period under review. In this connection the case of the Locomobile reveals how dealing with bore alone is liable to be very misleading. In 1911 and 1912 this make of car was offered, among other models, with a six-cylinder motor, having a bore and stroke of 4.50 inches, in other words, a square engine. The piston displacement of this engine was 429.5 cubic inches. In 1913, apart from any structural alterations, the bore was retained as before at 4.50 inches, while the stroke was increased to 5.50 inches, bringing the piston displacement up to 524.8 cubic inches. A new model has been added with a bore and stroke of 4.25 and 5 inches, giving a piston displacement of 425.4 cubic inches or 4.1 cubic inches less than the 4.50-inch square engine of 1911.

Several concerns such as the Packard, Chalmers, Haynes, Franklin and Stearns who brought out new models for last season, have retained them in exactly the same sizes for 1913, which bears out what has already been stated, namely, that in most cases the same size engine is marketed for 2 years without alteration as to piston displacement. The Packard models are now all six-cylinder designs, and while it might not be correct to contrast a six against a four, nevertheless a comparison of piston displacement shows that the new six-cylinder is smaller than the largest four previously manufactured. Reference to the table shows that while it is not much smaller than the large four-cylinder motor of last year, it is considerably larger than the 18 which was the smaller model. The displacement of the four-cylinder 40 Premier for last year was 334.0 cubic inches, while the new six-cylinder type has a displacement of 376.9 cubic inches or 42.9 cubic inches more than the preceding four cylinder.

The Carbureters for 1913

Many Companies Add New Models—Multi-jet Design Makes Steady Gains—Various Devices Attached to Facilitate Starting—Several European Products Now on the Market—Absence of Moving Parts a Pronounced Foreign Trend—Auxiliary Air Valve Continues in Popularity in America.

THAT the season of 1912 was an active one in carbureter research and invention is proven by the changes in many of the standard models as compared with their predecessors and also by the number of new models listed for this year, not a few of these being introduced by the largest makers. The heavier weight of gasoline used has been largely responsible for much of the carbureter activity, and coupled with this is the demand for extreme motor flexibility over an ever-increasing range of speeds.

The keen rivalry among the carbureter makers has played its part in this work of evolution, and while there is much that is new to be seen at the shows, there is also more behind the screens. One or two of the makers have announced that they have ready to show to the engineers new models which they are not going to announce to the public for some time.

To summarize whither the tide of carburetion is flowing is somewhat difficult, but in a sentence, it is leading in the direction of multi-jets and the reduction of moving parts, this conclusion being reached by a survey of the score or more of American carbureters, and also from the dozen European types that are now on the American market. Schebler has joined the multi-jet ranks with a new model, O, fitted with main and supplementary jets; Stromberg in its new models uses two jets, although this concern has used the double-jet idea in one of its models for several seasons; and Pierce in its new carbureter, which it makes for its own product, has added a supplementary jet. More could be cited. Up to the present the single-jet type is practically a 75 per cent. leader over the multi type.

There are various reasons which indicate the direction in which the wind is blowing when it comes to the reduction of moving parts, although at this date it is quite beyond the realm of speculation as to what the eventual type will be, and it is more than probable that the time will not arrive for years when any one type will be the adopted standard, because most satisfactory results can be had with different types.

In Europe the situation to-day is more defined. R. W. A. Brewer in writing on the subject to THE AUTOMOBILE, at the close of the recent Olympia show, said: "I think I am perfectly correct in saying that there was not a single European car at the Olympia fitted with any sort of extra-air-inlet device; the general tendency seems to be in the direction of a combination of jets or some type of varying jet orifice."

Very pronounced progress has been made in American carbureters in the fitting of easy-starting arangements. This movement started 2 years ago with the fitting of shutter valves to obstruct the normal air passage in order to increase the motor suction or pull on the gasoline in the spraying nozzle and thereby obtain a very rich mixture. At that time a few of the leading carbureter engineers fitted an interconnection between this shutter valve and the auxiliary air valve so that the latter could also be held shut when the shutter valve was closed. Today these concerns are going a step further and are fitting what may best be termed a gasoline by-pass pipe which connects direct between the float chamber or the nozzle and the intake manifold above the throttle; the modus operandi being that to start, the throttle can be practically closed so that the entire motor suction is on the upper end of the by-pass tube, this suction being sufficient to draw the pure gasoline through, giving the necessary richness. The different ways in which these starting by-passes are fitted are shown in the different illustrations which follow.

A problem in carburetion is to maintain a requisite suction or pulling force on the gasoline in the nozzle at the different motor speeds, so that the mixture will be of the desired composition, having the proper proportion of air and gasoline. There are many difficulties in this job. For example: At low speeds a richer mixture may be needed, and if enough gasoline is issuing from the nozzle there will be too much flowing when the motor speeds up and the pull or suction of the air passing the nozzle has increased in direct proportion with the increase in motor speed. To relieve such a situation means must be provided to keep the suction down and, instead of giving a mixture richer in gasoline at high speeds, give a mixture that is leaner.

There are several ways of establishing the desired balance at the nozzle. The oldest and best known method in America is by the auxiliary air valve. It operates as follows: All of the air enters the air passage surrounding the nozzle up to predetermined motor speeds, but when the motor speed increases the auxiliary valve opens and allows air to enter, which has not to pass the nozzle, but preferably enters the mixing chamber at a point higher up. The entrance of this air naturally cuts down the velocity of the main air supply entering around the nozzle, and so, with its velocity reduced, there is a corresponding reduction in the amount of gasoline issuing.

A second class of makers, who are apparently opposed to the

spring or dashpot-regulated auxiliary air valve, uses what may be designated a variable venturi, the venturi being the hourglass air passage in which the nozzle is located. The object gained by increasing the cross-section area of this passage on high speeds is identical with that in the auxiliary air valve, in that with the cross area increased the velocity of the air to the motor is kept constant and so the pull on the fuel in the nozzle is kept down. There are various ways of accomplishing this; one does it by a plunger piston which is controlled by the motor suction and which piston partially obstructs the air passage; another does it by a series of varying-diameter ring valves, and a third accomplishes it in a different manner.

There is a third class that uses neither the auxiliary air valve nor the variable air passage, but, on the other hand, regulate the suction by atmospheric pressure, this type of carbureter generally being one without moving parts.

There is a fourth class that aims to control this nozzle suction by mechanical means Generally a moving needle is fitted in the tip of the nozzle. This needle is interconnected with the throttle, and as the throttle is opened the needle is raised only in proportion as additional gasoline is needed. Then, too, there are some who use the moving needle in the nozzle, and also use the auxiliary valve in combination with it.

In the following pages the leading types of various carbureters now before the American buying public are briefly described, without any attempt being made to opinionate on their respective merits, a task left to the reader. Vertical-section illustrations, made from blue prints, are used wherever possible to show the principle on which the different types operate. The modus operandi of each is explained.

Schebler—Introduces Multi-Jet

There is a new Schebler carbureter for this year. Its official name is model O and it differs from all previous Schebler models in that it uses two spraying nozzles or jets, one known as the main jet C, is located in the venturi-shaped air passage which is concentric with the float and the other or secondary jet D is mounted higher up in the carbureter wall. This secondary jet is under the control of a plunger valve, which is raised from its seating by motor suction and permits the flow of gasoline past it. The main jet with the venturi forms the low-speed feature of the carbureter and performs all of the functions up to motor speeds of 400 revolutions per minute. Above this speed, the suction at the jet is reduced by the admission of extra air through a spring-regulated auxiliary air valve A. This auxiliary air valve governs the mixture between the range of 400 and 800 revolutions per minute. Above the latter figure the auxiliary jet D comes into play. The suction at this point lifts a small poppet valve at D, closing what may be called the auxiliary mixing chamber, and allows a mixture of gasoline and air to join the mixture secured from the jet in the venturi. The auxiliary jet is formed by the space left between the small poppet valve and its seating when the former is raised by the suction against the spiral spring holding it in place and by a tube which carries the gasoline from the float chamber to the auxiliary mixing chamber. The air for the auxiliary mixing chamber enters through a port in the casting, leading to the outside air. This carbureter is supplied with a hot-water jacket and with an easy starting shutter, which is operated by a bell-crank lever which closes by means of a butterfly valve B, in the main air inlet and locks the auxiliary air inlet through an inter-connection. The carbureter has three adjustment points; one, the needle valve which determines the size of the main jet; and the other, a knurled screw which determines the tension on the spring controlling the poppet valve for the secondary jet.

The Schebler L, Fig. 2, has been improved over the 1912 style. It operates on the same principle as the model O, but has but one jet. The suction at this jet is determined and governed by a spring-regulated auxiliary air valve V. This carbureter is provided with a modified Venturi mixing chamber B, the smallest section of which is at L, the point where the fuel is sprayed from the nozzle N. The needle valve regulates the flow of gasoline through X and from the supply source. The auxiliary air valve is regulated by an adjustment screw which varies the tension in the conically wound spring. This spring acts against the suction of the motor, and the greater the speed of the latter, and hence the greater the suction, the more the auxiliary air is admitted due to the increased opening of this air valve, which is also provided with dash control through the rack and pinion shown.

In operation, the main air supply enters vertically through the main air passage, mixing with the atomized fuel at L. The needle valve may be externally adjusted by means of a thumbscrew. The nozzle extends diagonally into the mixing chamber and is provided with a long tapering needle which admits of fine adjustment. There are means of regulating fuel supply and air supply relative to one another externally by dials playing over graduated scales and thus indicating the proportions of the mixture ingredients. This type is waterjacketed around the outlet passage to the manifold. A spring pin provided with a bell-crank lever also makes it possible to depress the float, thus raising the needle valve and flooding the carbureter when necessary. A very good feature of this construction is the provision for the removal of the entire float chamber, float and its needle-valve mechanism. A single nut working on the threaded lower por-

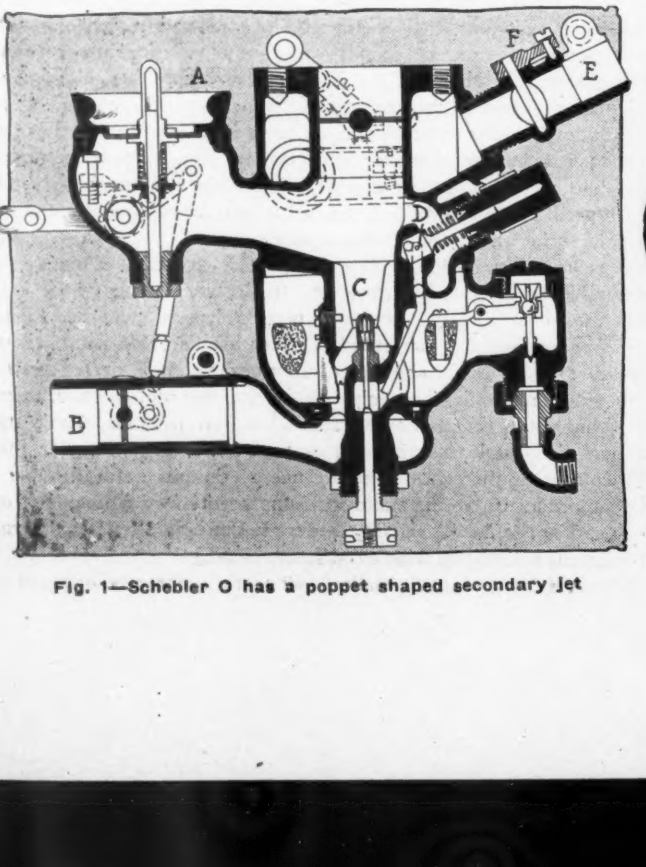


Fig. 1—Schebler O has a poppet shaped secondary jet

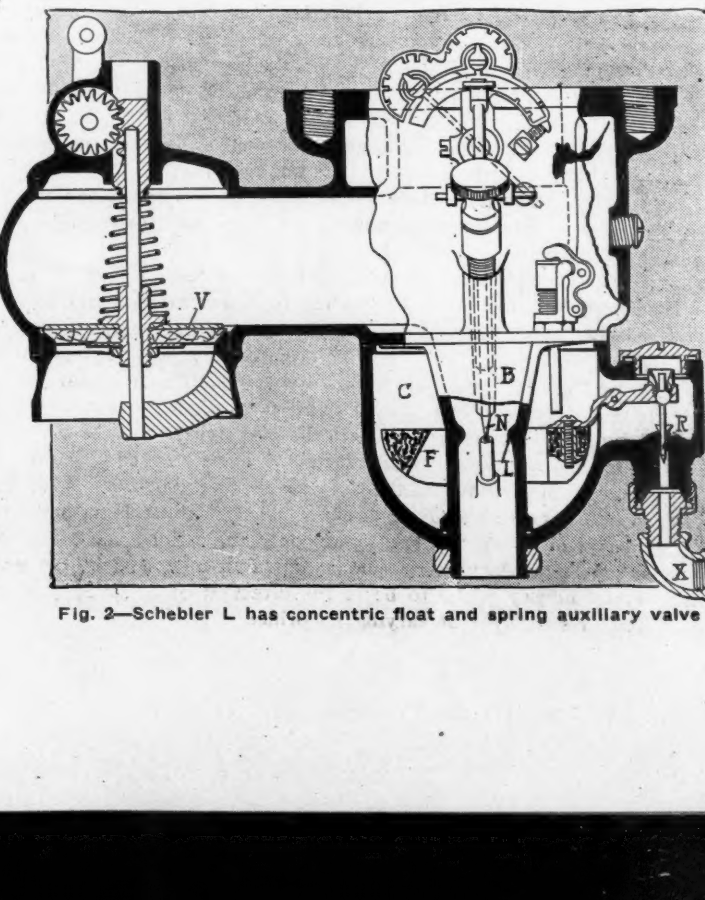


Fig. 2—Schebler L has concentric float and spring auxiliary valve

tion of the main air inlet tube holds the fuel chamber in place, and for cleaning purposes this accessibility feature should prove of great value.

The other Schebler models are continued as during 1912.

Stromberg—Two New Multi-jet Models

To the three Stromberg carbureter models of last year have been added two new models which, while built along general Stromberg lines, incorporate some new features by way of improvements.

The three models of last year, A, B and C, have all been improved in that they are fitted with a new funnel-shaped venturi tube in the center of which is located the main nozzle. This venturi threads into the body of the carbureter. Of these models, A and B are single-jet types and C is a double-jet design. B has a concentric-float construction for small motors, while A and C are not concentric designs.

Of the new models, G is quite similar to model A, Fig. 5, excepting that it is made without a waterjacket. It is also a double-jet type, the supplementary jet being located in the horizontal passage between the mixing chamber and the auxiliary air valve. This jet has an adjustable needle-valve regulation. The venturi is threaded into the carbureter body and this part is so grooved that an opening extends around the venturi. The side of this opening towards the float chamber opens through the main body of the carbureter to the atmosphere and the other side opens in the gasoline tube leading to the auxiliary nozzle at a point above the gasoline level. Its operation is as follows: Low speeds are supplied by the primary nozzle in the venturi; as the motor speed increases, the suction on the auxiliary gasoline nozzle also increases, but no gasoline issues from this nozzle until the suction of the motor on it becomes greater than the capacity of the bleeder hole connecting with the atmosphere through the groove around the venturi. After this point is reached, gasoline flows through the supplementary nozzle, its flow increasing or decreasing with the motor speed.

Model D, the other newcomer, Fig. 4, is a two-jet type with the auxiliary nozzle I located in the passage between the mixing chamber and the auxiliary air valve and controlled by the latter so that the needle K controlling the nozzle is raised when the auxiliary air valve opens. The air valve is a new design of balanced construction and works in a chamber surrounded by a sleeve which can be operated from the dash. This sleeve fixes the size of the air opening for the valve. The hollow valve stem

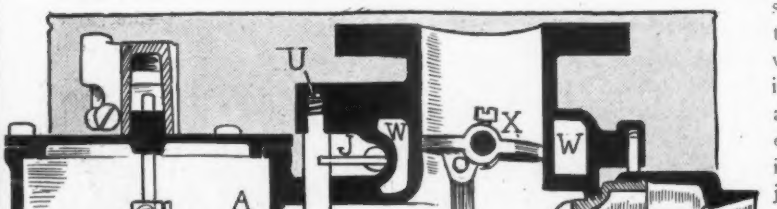


Fig. 3—Rayfield model D carbureter with interconnected throttle and air

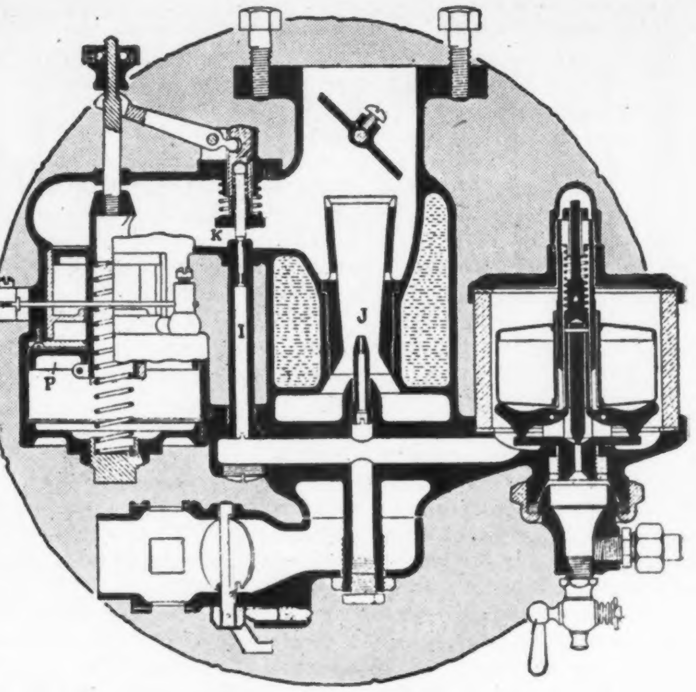


Fig. 4—Stromberg new double jet with eccentric float

carries two pistons operating in a dashpot, so as to give a richer or leaner mixture from the auxiliary jet, depending on whether the sleeve-controlled air opening is exposed to a lesser or greater extent. No adjustments are required with this carbureter, save for the use of the correct size of main nozzle and auxiliary-jet needle, a variety of sizes being provided by the manufacturer.

Rayfield—Continues Mechanical Type

The Rayfield carbureter, Fig. 3, belongs to that class in which the flow of gasoline from a single nozzle is controlled by a needle valve interconnected with the throttle, so that with wider throttle opening there is a wider opening in the nozzle. But this interconnection with the throttle goes further in that the main air entrance is controlled by a butterfly Y linked to the throttle X, thereby regulating the primary air supply, according to the throttle position. There is also an auxiliary air valve K under spring regulation. The variable needle valve L is held seated by the spring U and is operated by the arm J. It is interconnected with the throttle and air shutter X and Y, these two valves being linked together by the bar Z. These valves have provision for adjustment so that they may be so operated relative to each other that the proper proportions of air and fuel are combined in the mixing chamber B. The auxiliary air valve K is so adjusted as to open under the greater suction of high speeds and to allow the entrance of the needed air for such increased speeds. The stationary air intakes are seen at V and back of the needle valve, L, opening ino the mixing chamber, as shown. Referring to air valves X and Y it will be noticed that butterfly throttle has a slight lead on the valve Y. This provides for slow running with closed or very low throttle, allowing just enough air to pass in proportion to the very small nozzle opening.

The Rayfield reveals standard float construction so far as the float mechanism is concerned, in that the float D is of metal playing in the float chamber A, and connecting with the inlet needle valve through the pivoted lever E. As the fuel enters from the supply source it is strained through the screen F before passing through the needle valve. Admission to the mixing chamber is through the center of the nozzle, which is opened and closed by the needle L. The lower end of this nozzle which communicates with the float chamber is provided with several radial holes M running to the hollow center. The gasoline enters

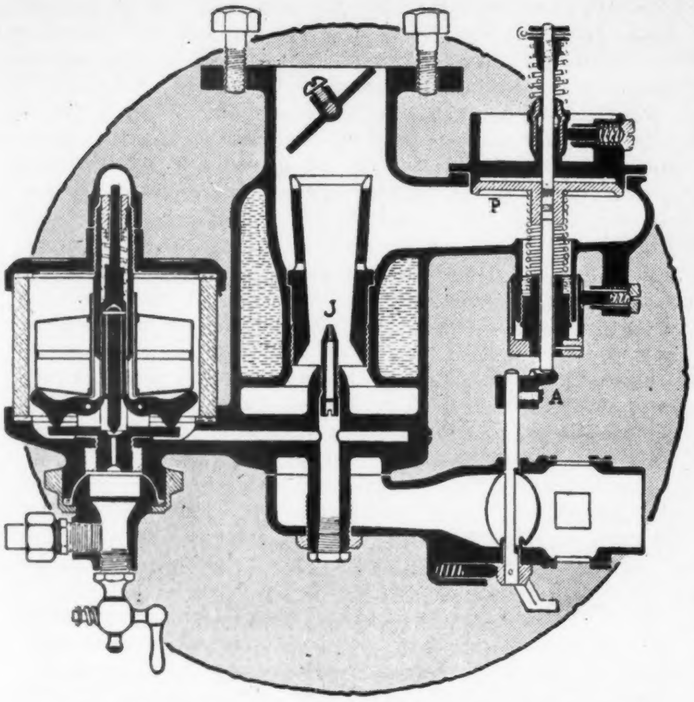


Fig. 5—Stromberg single jet model with eccentric float feed

these holes and thence flows up through the nozzle to its orifice.

Waterjacketing is extensive, the mixing chamber being fully covered where possible, as shown at W. A dam at the point where the fuel passage merges with the air chamber allows for the collection of a small amount of gasoline when the engine is not running. When started, this pure fuel is drawn directly into the motor, priming it in the usual way.

It should be especially noted in a consideration of the Rayfield instrument that the mixing is entirely automatic, no suction or vacuum principle being utilized to regulate the amount of fuel supplied, this being mechanically apportioned by the driver when he opens the throttle. Such an instrument must be adjusted for every variable, there being four points for regulation. However, when these are properly related the instrument has proven remarkably efficient. This carbureter was used on the winning Mercedes in the 1912 Vanderbilt and Elgin races.

Zenith—Without Moving Parts

There are in the Zenith carbureter, Fig. 6, three jets. Two of them are concentric, namely, G and H, and the third one is on the same level as the butterfly throttle valve at U. The outer annular jet H is connected at its lower end with the tube E, this tube being fed by a small orifice from the float chamber. The supply of petrol into this tube is constant for it depends merely upon the height of the petrol in the float chamber; thus the supply of gasoline to the annular jet does not increase when the engine suction increases; indeed this supply actually decreases for the jet is starved owing to an insufficient supply into the small tube E.

The action of the main jet G is similar to that of ordinary single-jet carbureters, so that it is of course possible to make it of such a size as to give the best results for a given speed. It is, however, patent that should this given speed be increased, or not reached, then the mixture will become too strong or too weak respectively. It is in this fact that the *raison d'être* of the subsidiary jet is to be found, and it will be seen that it is possible to strike the happy medium by drawing the necessary quantity of petrol from two jets which operate in diametrically opposite directions. As the speed of the engine increases, more and more gasoline is drawn by the suction from the main jet in direct proportion to the progressive diminution of the quantity of petrol per revolution of the other jet.

So much for the two main jets. Now a few remarks with reference to the small throttle jet situated at the upper end of the tube J; this tube which is for the purpose of adjusting for slow running is open at both ends and fits closely into a well. On the left-hand side of this well is cut a vertical groove terminating at U. On the lower portion of the tube O is cut a partial helix which coincides with the aforesaid vertical groove. It will thus be understood that by rotating the tube J by means of a milled screw the point of contact between the vertical groove and the helix will be raised or lowered according to which way the tube is rotated. Thus, if the point of contact be low, more petrol can be sucked through U, while if the point be raised the mixture becomes weaker. By this means the slow running of the engine can be adjusted from the exterior by rotating the small screw B, which is fixed to the tube. When the desired running has been obtained, the screw is tightened to permanently set the position.

Under ordinary running conditions the tube J does not come into action, the two jets providing all the petrol that is necessary. It is principally under starting and slow running conditions that this part of the carbureter comes into play. In order to start the engine the throttle is only opened very slightly, and on turning the engine over by hand, a very strong suction is set up at U, which draws the petrol through the vertical groove and out through U, where it is vaporized by the inrushing air. By this means, at the first turn of the crank, a quantity of suitable mixture is induced into the cylinder, causing the engine to start immediately.

When an engine is throttled down to run very slowly, out of gear, the depression around the concentric jets is extremely weak and not sufficient to draw petrol from them. The petrol will then rise in the tube J until it reaches the point of contact when it will be strongly sucked up and sprayed at U, thus providing the exact quantity of mixture necessary to keep the engine turning over slowly out of gear.

The carbureter is a simple one and its modus operandi is extremely ingenious especially the details connected with the tube U. The later models have a small glass window in the float chamber through which it is possible to at any time observe the level of the gasoline in the float chamber. This window is not, however, shown in the diagram.

Holley—1912 Type Continued

The Holley is a good example of the concentric-float type of carbureter in which the main air passage, Fig. 7, does not rise

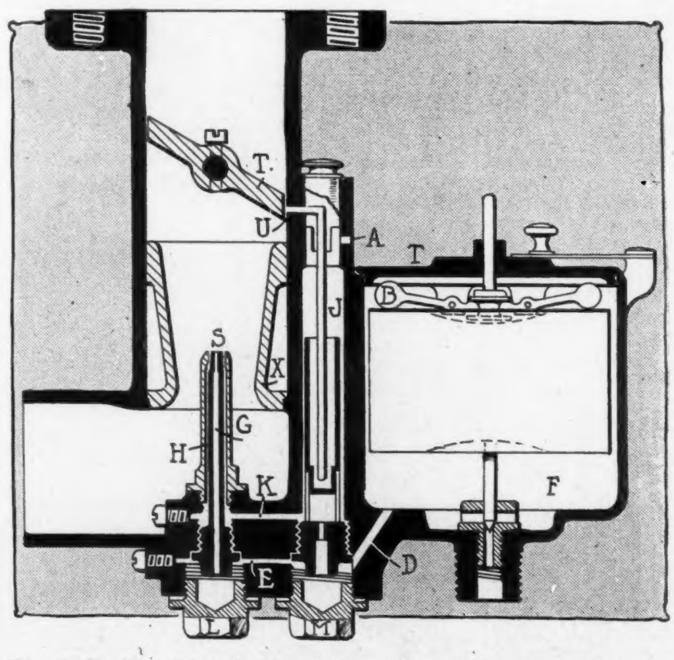


Fig. 6—Zenith carbureter employs auxiliary jet at butterfly valve edge

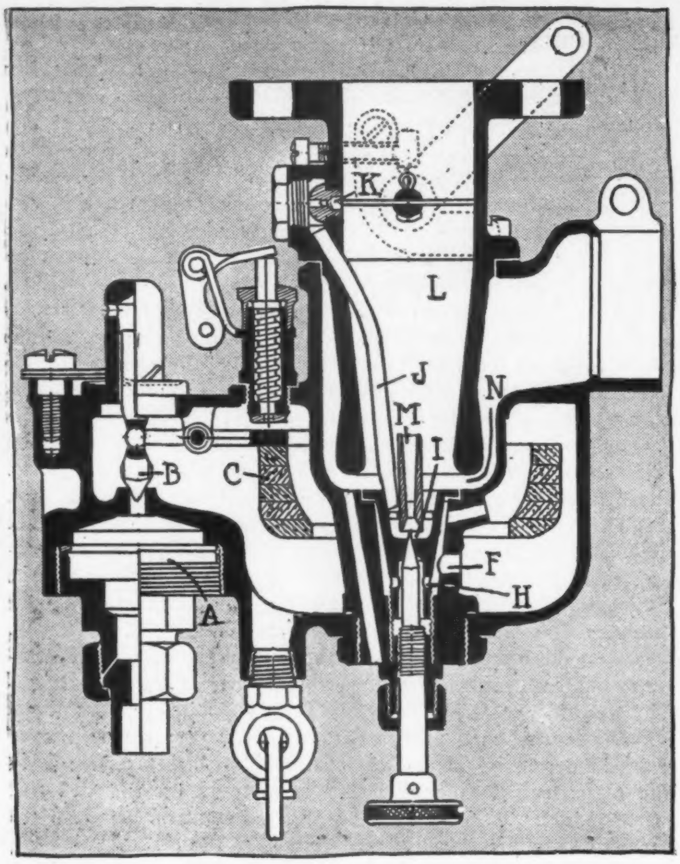


Fig. 7—Holly carbureter has concentric float with adjustable jet

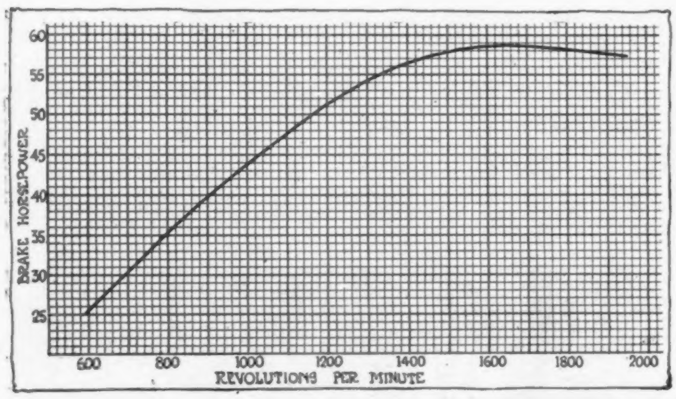


Fig. 8—Steady rise in horsepower curve of six-cylinder motor with 4.125 x 5.25-inch cylinders. Zenith carbureter

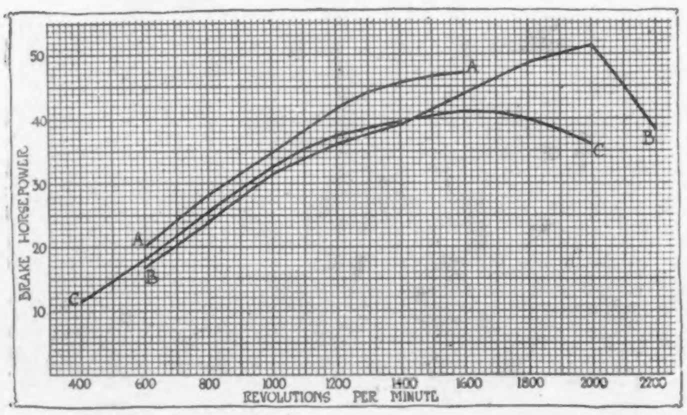


Fig. 9—Horsepower curves, Schebler L, carbureter. A, L-head four cylinder 4.5 x 5.25; B, valve in sides 3.8125 x 5; C, L-head 4.125 x 5.25

vertically from the base of the instrument, but through the side, at a point above the level of the float chamber, being deflected downwards by a venturi-shaped mixing chamber, the passage of the air being indicated at N.

In this type the entire air supply passes the spray nozzle. The cork float mechanism C is conventional, and fuel enters the float chamber through the needle valve B, after having passed through the strainer disk A. It passes from the float chamber through the opening F drilled through the wall separating the nozzle well and the float chamber. From this nozzle well E the fuel entered the nozzle proper through the holes H, rising past the needle valve I and lodging in the cup-shaped upper end, just submerging the lower end of the tube J, which extends to the edge of the throttle disk controlling the supply of fuel to the engine. Cranking the latter with the throttle nearly closed draws the fuel from the well through tube J and the calibrated plug K, and directly to the manifold, thus priming the motor and acting as an easy starting feature. After the engine is running the fuel sprays through the needle valve and up through the tube M, and thence directly on to the motor through L. When thus running, air is drawn through the holes N surrounding the standpipe M and part is drawn up through the tube J, keeping the starting well completely cleaned out.

It will be seen that there are no spring-controlled air valves, the suction being depended upon for control of the air supply. The standpipe M has a venturi shape, aiding in the fuel vaporization. The carbureter has only one adjustment, that being of the needle valve I. The principal feature of note in the carbureter is the utilization in the nozzle action of the pressure drop due to the velocity of the flow of air drawn through, rather than the pressure drop causing the air to flow, making the carbureter automatic in its proportioning functions. Having fixed the needle valve adjustment, the ratio of air to gasoline must be constant throughout the range of engine speeds.

Kingston—Uses Ball-Type Air Valve

The Kingston carbureter, a concentric-float design, continues to use a series of metal balls forming the auxiliary air supply, but has modified the general appearance in that the needle valve D, which controls the supply of fuel through the nozzle, is mounted at an angle, and has the usual external adjustment. In this carbureter the requisite vacuum at the nozzle is maintained through the medium of the auxiliary air valve. The weight of the balls constituting this valve being so regulated that they are lifted in rotation to supply the requisite demands of the energy.

The fuel is sprayed into the mixing chamber at E, where it comes in contact with the main air supply entering at F, the mixture passing on to the motor in proportion to the opening of the throttle G and through H. With greater engine suction the auxiliary ball-check valves come into operation, being raised from their seats and admitting additional air to the mixture. These opening areas are so arranged that the effect produced is similar to the action of an automatic expanding venturi.

This Kingston design includes a special provision for easy starting, in addition to the choke throttle placed in the air inlet at J, which, when closed, produces a very strong suction or vacuum at the spray nozzle drawing a very rich mixture.

The well K around the nozzle fills partially when the engine is not running, due to the greater height of the gasoline level in the float chamber C. This gives a reserve supply of fuel which is directly drawn through the inlet H to the motor, priming it on the first few suction strokes. After the engine is running the fuel is drawn swiftly through this well and there is no opportunity for it to collect here as long as the engine produces the vacuum around the nozzle.

Stewart—Has Floating Control

This Stewart precision is a concentric carbureter of the constant-suction type and the main working element consists of a vertical cylinder gunmetal valve E supported in the air stream and provided with a small tube dipping into the float chamber,

its upper end being level with the top of the valve. The illustration Fig. 12 shows the valve E off its seat as it is when in operation. Along the upper end of the tube is an annulus communicating by way of a series of holes with the lower or atmospheric side of the valve and the air passes through the valve head up the annulus drawing gasoline up the center tube T. The main hole through the valve head is .375 inch diameter, while the inside diameter of the gasoline tube is .125 inch. The small tube reaches down into a gasoline well and formed within the valve stem, and the valve stem is provided with a lower extension tube H which regulates the supply of fuel to the engine. When the floating valve E is upon its seat, sufficient air passes through tubes C and by way of holes R admitting air from below. This air is concentrated round the orifice of the central tube, thus providing a suction effect sufficient for starting purposes. Increased suction effect lifts the valve E to a greater extent and slides the small tube surrounding the needle P; this needle is tapered so that the sliding up and down of the tube varies the size of the annulus formed by the tube and needle and this varies the quantity of gasoline passing into the chamber O. In its seated position the lower tube H seats around the metering pin P, but with sufficient clearance so that enough fuel can pass for starting purposes. In the lower part of the instrument there is a dashpot to prevent the too rapid movement of the valve E. The cork-hinged float and its valve need little description. After the motor is cranked the vacuum increases, the valve E lifts from its seat, allowing additional fuel to pass the regulating pin P in proportion to the suction. This raising of E also allows a proportionate quantity of air to pass through V to combine with the additional fuel. Thus in running, the valve E is held up an amount in proportion to the vacuum created by the demands of the motor and is entirely automatic except insofar as the regulating pin must be adjusted.

Flechter—Single or Multi-Jet

The Fletcher carbureter is made in either single or double-jet types, the latter being for use in larger cars. The carbureter is of the concentric float type with a fixed jet working within a modified venturi. The additional air supply for intermediate and high speeds is furnished by an auxiliary air valve. In models above the 1.25-inch size the auxiliary air valve is controlled by a piston and dashpot arrangement which prevents chattering, below this size the auxiliary air valve is controlled by a spring. The main fixed jet within the venturi and the air which enters the venturi passage from the lower extremity take care

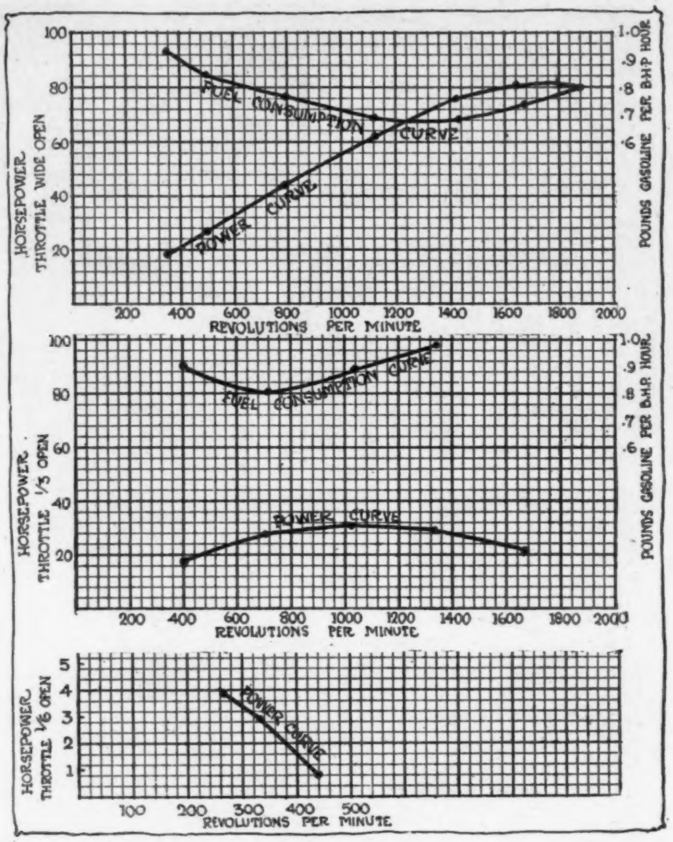


Fig. 11—Horsepower curves with different throttle openings using Newcomb carbureter. In each case A is the power curve and B the fuel consumption curve. These curves are plotted on a basis of revolutions per minute and in the case of the fuel consumption read in pounds of gasoline. There are roughly 6 pounds to a gallon of gasoline

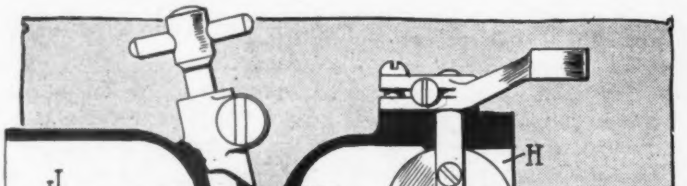


Fig. 10—Kingston carbureter uses concentric float and ball auxiliary air valves

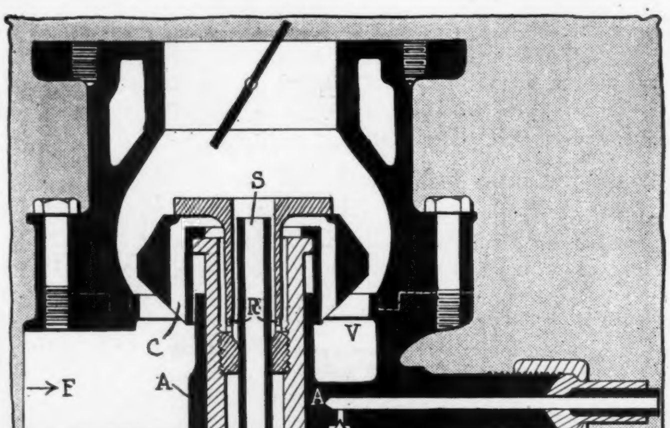


Fig. 12—Stewart precision multiple concentric jet carbureter one adjustment

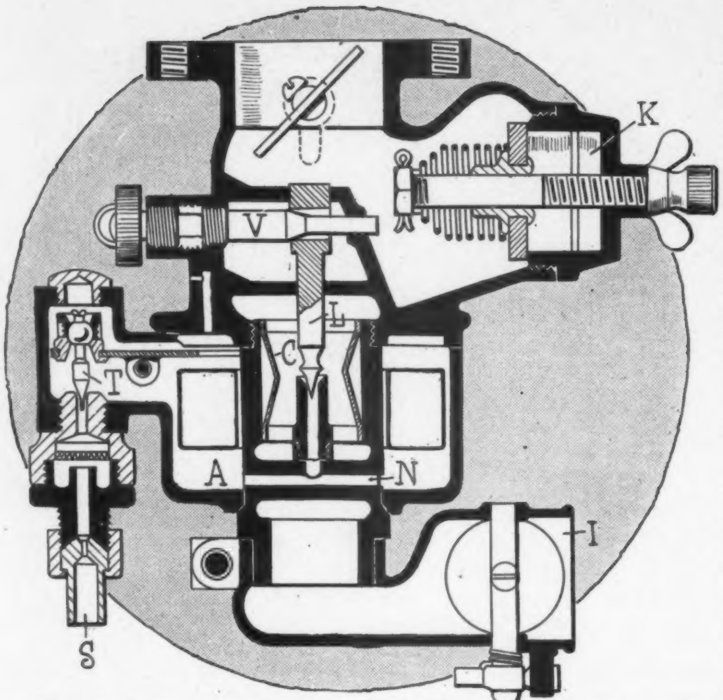


Fig. 13—Breeze carbureter uses variable jet in modified venturi passage

of the low-speed requirements of the motor. As soon as the motor speeds up and additional air is required, the auxiliary air valve opens. The second jet in the larger carbureter is placed between the auxiliary air valve and the intake passage. When the auxiliary air valve opens a stream of air passes across this secondary jet, creating sufficient suction to draw gasoline from it. An easy starting device which closes the main air supply except for a small opening and which holds the auxiliary valve tightly on its seat is furnished in the later carbureters. The priming device works on a ring and depresses the whole float instead of one particular part of it. The float arrangement is conventional, but the needle valve for fuel admission is bronze with a chrome-nickel steel seat welded in place. Outside finish is acid dipped and treated with a sand blast.

Breeze—Unique Jet Control

In the Breeze model, Fig. 13, the relative positions of the air passages are seen, there being two separate inlets I and K, instead of bringing both passages to a common opening. In the Breeze there is a venturi mixing chamber C, the spray nozzle and its adjustment being concentric with it. Fuel enters at S by the needle valve T, under control of the concentric float and flows into the chamber A. The tube N connects with the nozzle. A rather unusual needle valve adjusting feature appears on this device. The needle L is regulated by the horizontal stem V, which is tapered where it is in contact with the slot in the needle. This taper acts to vary the height of the needle as the stem is screwed in or out. It works against a spring fitted around the needle and seating on a collar just below the taper stem slot. This type is known as model SL. Model H, which is similar in principle, has been improved so as to embody an easy-starting feature. When the carbureter is primed in the regular way, a jet of gasoline is injected and confined in a pocket on the top of the air valve. When the engine is cranked, this fuel is drawn in.

S. U.—Variable Venturi Opening

In the S. U. carbureter, an English importation which, however, is now being manufactured in America, the main variation from other designs is found in the fact that the jet is set at an angle of 45 degrees in the choke portion of the jet chamber, in which chamber the passage of air is blocked by the interposition of a concentric piston P. The piston is slidable either upwards or downwards in its cylinder, being guided by a piston rod, the said piston rod carrying at its upper end the mushroom suction disk of a pair of bellows B in the suction chamber. The lower end of this piston rod carries a tapered valve, which enters the center of the gasoline jet. Between the upper portion of the jet chamber and the butterfly throttle, a duct is formed connecting to the interior of the bellows suction chamber. While the engine is running slowly, the piston obstructs the air passage across the jet, the clearance being about .031 inch. This very small area allows the air to pass with sufficient velocity thoroughly to atomize the fuel delivered. Obviously, as the throttle is opened, the suction increases, not only on the jet but also on the bellows above the disk in the suction chamber, as the said chamber is connected as aforementioned through a passageway. This has the effect of contracting the bellows, and drawing the piston further away from the jet, so affording a larger area for the passage of the air, while at the same time the tapered needle-valve is drawn further up the jet, the orifice is enlarged, and a proportionately larger portion of fuel is delivered. The taper of the needle is made such as to give a correct mixture for any position of the concentric piston. The needle is secured in the piston by a grub-screw, and can be altered in position relative to the piston. By this simple means a primary alteration of the jet orifice can be made which obtains proportionately through-

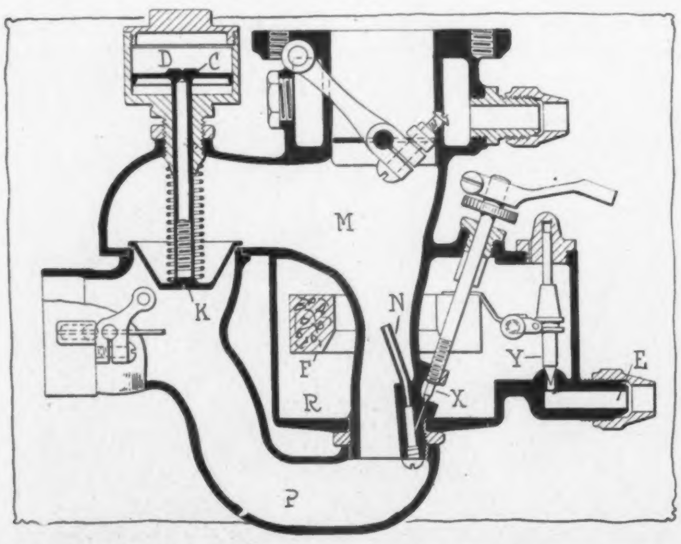


Fig. 14—Mayer model K employs fixed jet and concentric modified venturi

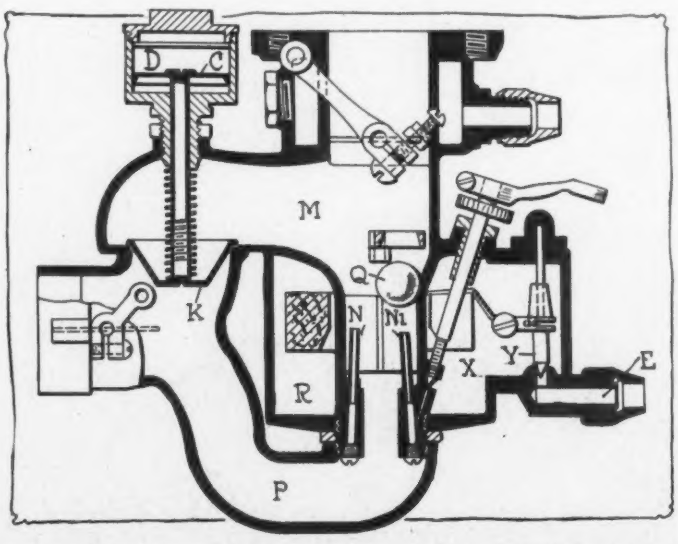


Fig. 15—Mayer carbureter uses a ball regulated auxiliary jet in new model

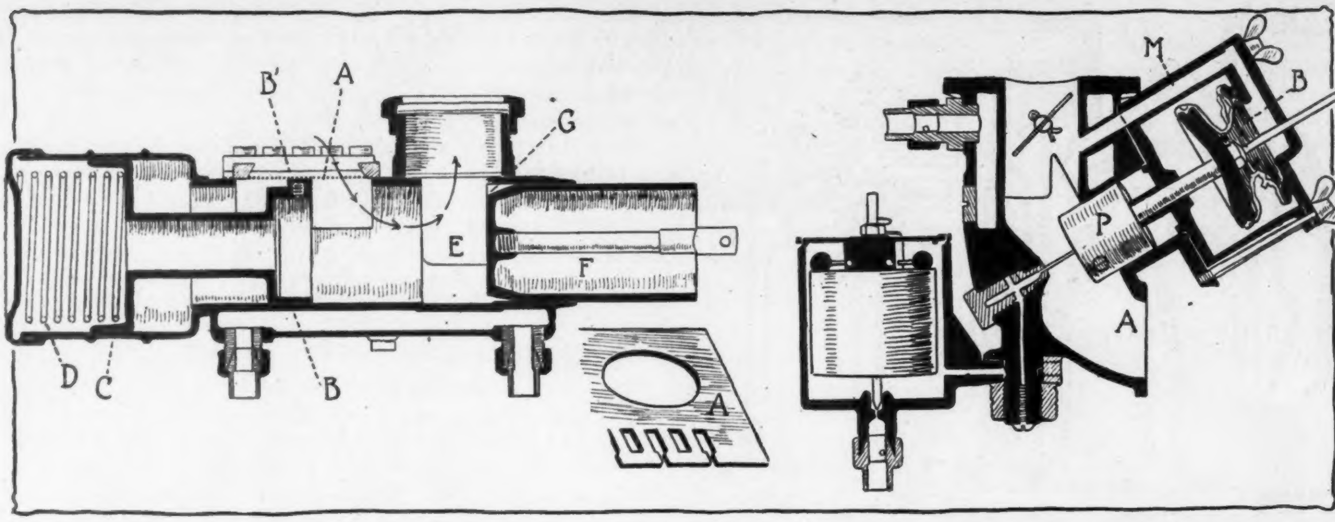


Fig. 16—Polyrhoe carbureter uses variable number of jets contained in flat plates. S. U. carbureter piston suction valve governed by leather bellows

out the scale of throttle opening, and is, in fact, an adjustable jet effect. At the same time the longitudinal section of the needle can be altered by emery paper or filing to suit the particular requirements of any engine in any particular position of throttle opening.

This instrument has behaved so satisfactorily in Europe that it has not been necessary to make any changes in it for the coming year. One of its chief merits advanced is its ability to operate for long periods with the engine turning over slowly and at the same time having the ability to accelerate rapidly without choking. When the instrument is fully open, it gives an unusually free air passage to the engine, and in tests has run a standard six-cylinder car at a speed of 3,700 revolutions per minute on the bench, and yet giving the ability to throttle for ordinary running without difficulty. A special type of this instrument is manufactured for sleeve-valve motors.

Air-Friction—Variable Air Passage

The Air Friction carbureter, Fig. 17, is so called for the reason that the air passing through the conical valve V surrounding the nozzle R raises or lowers this valve in proportion to the throttle opening, thus automatically controlling the mixture. The rising and falling of this valve gives a variable venturi action, thereby controlling the air pull on the gasoline issuing from the jet. The spray nozzle R serves to spread the fuel, and presenting a large wetted surface to the incoming air entering through S. The nozzle opening is regulated by the thumbnut N, and is held in position by nut Y. There is a single air inlet screened at A and which may be closed by a butterfly B. The float mechanism is conventional, consisting of float X linked to needle valve F. The entering fuel is strained at G. The outlet tube is very short, being controlled by throttle L.

Mayer—Adds Double-Jet Model

With the object of preventing the tendency to flutter and to fly wide open with more or less of a jerk on account of suddenly increased suction, the Mayer carbureter has its auxiliary air valve provided with a dashpot which controls the operation of the valve. This feature is indicated by D, while the piston which works in the small cylinder C. In addition to working against the air in this cylinder, the valve K acts against a spring as well. Such a construction necessarily requires accurate adjustment of the spring with relation to the dashpot position, but once properly mated relative to each other, the feature should prove of advantage.

Fig. 15, which shows the latest Mayer type, a two-jet device, illustrates the placing of both of these nozzles N and N_1 directly in the main air passage P. The slow-speed nozzle N communicates directly with the mixing chamber, whereas the auxiliary jet N_1 comes into play only at higher speeds, or when the vacuum created is great enough to overbalance the weight of the ball Q, lifting it from its seat and allowing the entrance of additional fuel to supply the greater demand.

The constructional features of the Mayer carbureters, which appear in three models, G, H and K, are all along the same lines, except that type G is not provided with dashpot air control, and both G and H are single-jet instruments. In these two models the jet is located in the position which the auxiliary jet N_1 occupies in model K, Fig. 14. The needle valve adjustment is at X, while the gasoline enters the float chamber R at E, its flow being controlled in the usual way by the needle valve Y linked to the float F. The primary air passage P extends under the float chamber and passes the nozzles, while the auxiliary air combines with the mixture at M. Water-jacketing of the passage to the manifold is done.

Polyrhoe—A Multi-Jet Example

The constructional peculiarity of the Polyrhoe carbureter, a foreign one, lies principally in connection with the jets. These take the form of a series of slots cut in brass plates of known gauge. Fig. 16 shows on an enlarged scale a portion of one of these plates A of which there are two to a carbureter. The actual jet orifice is rectangular or nearly so in section. B is

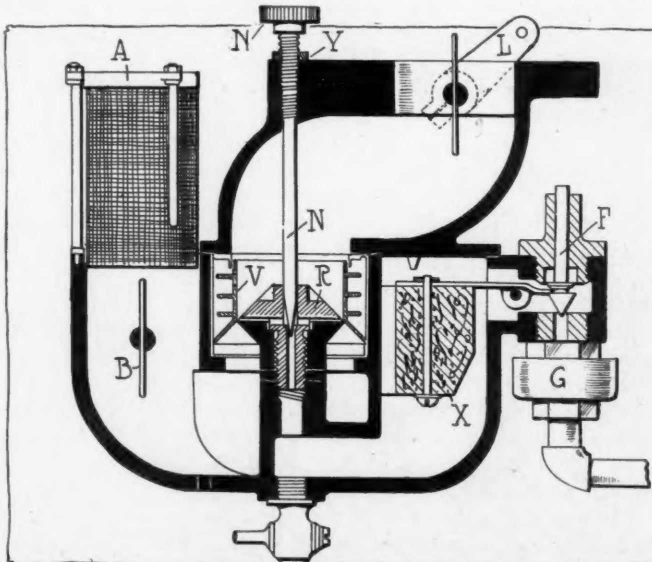


Fig. 17—Air Friction variable jet carbureter with single adjustment

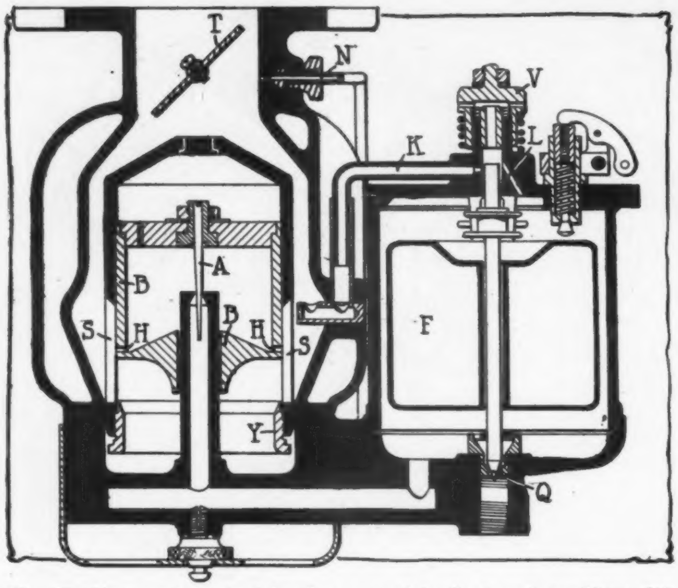


Fig. 18—Newcomb carbureter has eccentric float and auxiliary jet feature

a piston sliding freely in the body of the carbureter and having on its upper part a lip B^1 secured to it. This lip controls the quantity of air passing, the passage of which air is suggested by the arrow shown. Air flowing into the carbureter therefore must of necessity pass in close proximity to the series of jets A and its inductive influence is felt on all the jets that are situated on the right hand of the lip. To the piston B is attached by a neck a second piston C of larger diameter and this piston has at the back of it a helical spring D. The purpose of this spring is to tend to close the air supply when there is only a small negative pressure in the mixture chamber E. It will be understood that the pressure or rather negative pressure in E is at once communicated to the spring side of the large piston C. Thus when the suction of the engine is a strong one a considerable negative pressure is caused at the back of the piston C and the pressure of the atmosphere acting upon the other side of the piston compresses the helical spring and moves the small piston B to the left, thus by means of the lip B^1 permitting more air to flow and at the same time opening up a greater number of jets.

F is a piston throttle of usual construction, having a slot G close to the engine branch for permitting slow running with an all but closed throttle. It should be stated that the row of jets is situated slightly above the level of gasoline in the float chamber and the difference of pressure under which the instrument works is just sufficient to cause the fuel to flow from the jets which happen to be in operation at the time and to cause an effective spray.

The proportion of air and gasoline opening are constant at all throttle positions, but in order that these may be varied at times to suit existing weather conditions, an air slide is provided over the rectangular air opening and having in view the fact that this slide works at right angles to the movement of the control piston and lip its effect upon the air supply will be readily understood.

The Polyrhoe carbureter belongs in the true sense of the word to the multi-jet type, for there is one jet to each .063 inch of air port—or as the makers call it throat—opening. The size of the jet is about .006 inch deep by .025 inch wide. That the carbureter is good for slow running is proved by the fact that a four-cylinder engine has been run down to 140 revolutions per minute and a six-cylinder to 100 revolutions per minute.

There exists in the case of this carbureter a very small percentage of carbon monoxide in the exhaust gases for the percentage does not exceed 0.2 when the engine is loaded and 0.8 when the engine is running light. The proportion of CO_2 varies from 13.4 per cent. to 13.8 per cent. when the engine is loaded, and from 13.2 per cent. to 13.5 per cent. when the engine is running light, the consumption of spirit of 0.760 specific gravity being at the rate of 4 to 10 miles per gallon on the track at a speed of 20 miles per hour.

The salient features of this carbureter are: A large number of rectangular jets formed by the superimposing of two perforated and slotted plates, the jets being controlled by a slide which also governs the air supply, such slide being operated by the air suction. A hand-operated shutter which varies the proportion of air in the mixture throughout the entire range of the carbureter.

Feps—No Ball or Spring Valves

The Feps carbureter is of the fixed-venturi type with an auxiliary gasoline jet and an auxiliary air valve for controlling the suction at the jet when the engine speeds rise to such an extent that an incorrect mixture is given by the main fixed jet in the venturi. The carbureter is free from springs and ball checks. Fuel is admitted by a conventional concentric float, the only unusual feature being the insertion of a conical screen C, Fig. 19, in the gasoline line through which all the fuel must pass.

The passage to the inlet manifold rises vertically from the venturi and the course of the fuel is through the low-speed jet J, after which it is mixed with the air which enters the venturi passage at the bottom. After the speed of the engine has increased to such an extent that the suction on the jet is great enough to give too rich a mixture, or, in other words, at intermediate engine speeds, additional air is admitted through the auxiliary air valve H. This leather-faced valve is held on its seat solely by its own weight. Greater suction lifts the valve higher as the suction increases, thereby increasing the air passage formed between the edge of the valve and its seat. An adjustable stop limits its final lift. This stop is controlled by the knurled screw F. When the suction increases beyond that necessary to lift the auxiliary air valve against the stop, the auxiliary jet comes into play: Increased suction causes the pull on the auxiliary air valve to increase, and this causes it to pull against the stop which limits its lift. The stop is movable and is attached to the metering pin which controls the opening of the auxiliary jet, hence when the pull increases the metering pin is lifted and the auxiliary jet comes into play. The supply of air is still further increased by the augmented lift of the

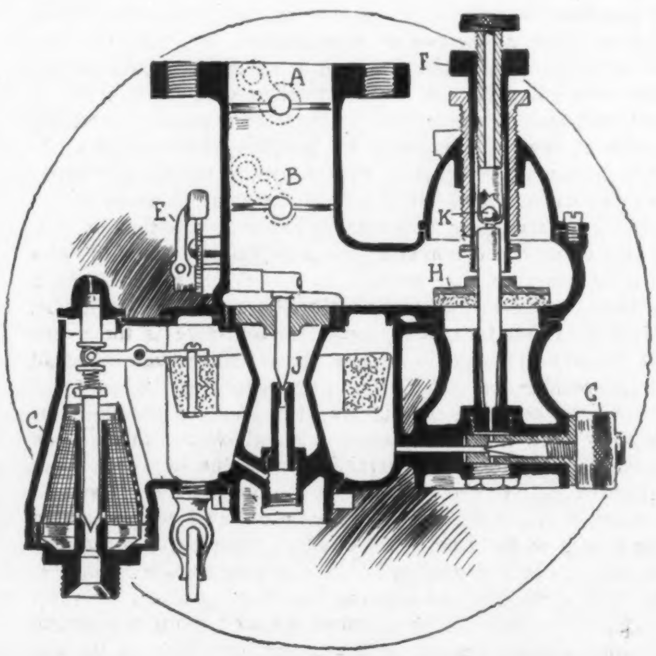


Fig. 19—Feps new carbureter without any spring or ball valves

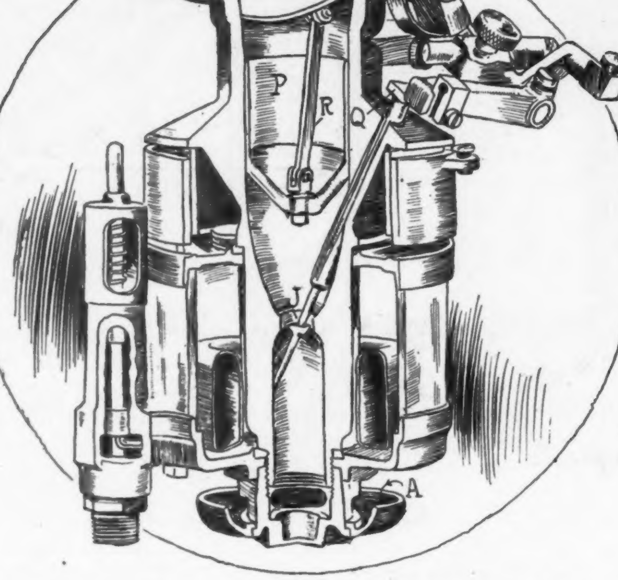


Fig. 20—New Miller has mechanical control for fuel and air supply

auxiliary air valve along the metering pin, and so the required lean mixture for high-speed running is obtained.

The carbureter has an easy-starting tube which extends from the float chamber to a point just below that at which the carbureter is connected to the manifold. All air supply may be cut off by a shutter A, confining the suction to the easy-starting by-pass and furnishing a supply of gasoline to the motor.

The carbureter has an adjustment for intermediate speed and another for high speed. The first is by means of the knurled screw F, which determines the lift of the auxiliary air valve, and the second is by the knurled screw G, which determines the gasoline flow to the auxiliary jet. Besides these two the primary jet can be regulated by means of the needle valve, the adjustment being made by turning the link E. The throttle is placed a little lower than usual at B.

Carter—Spirally Perforated Jet

In speaking of multiple jet carbureters, we ordinarily refer to the types which utilize two or more nozzles, one being the primary or main office and the others being merely auxiliary jets which come into play with increased motor suctions.

Although making use of this principle of supplying increasing amounts of fuel, automatically, by bringing additional jets into play in proportion to greater engine speeds, the Carter instrument, Fig. 21, accomplishes this result in a mechanically different way. Referring to the sectional view; the multiple-jet fuel tube B, located in the funnel K, has a multiplicity of small holes or jets arranged spirally around its cylindrical surface. As a vacuum is created in the carbureter by the suction of the motor, the fuel rises and falls in the tube B accordingly as the motor-speed changes. The fuel in the tube sprays out through the small jets, the number operating depending upon the height of the fuel. By the use of a multiplicity of very small openings, the gasoline is finely divided up into a mist, which aids in its union with the air. By this spiral arrangement of the jets, each small emission of fuel receives its own proportion of the air supply. The main jet which is alone in operation at low speeds is located at the bottom of the tube B. The main air opening is above this lower orifice. It is located at D. The mixing chamber proper is at H. The carbureter has a spring controlled auxiliary air valve A, with the operation of which valves we are already acquainted.

A rather unusual feature of the Carter instrument is the ball float E which rests upon the lever F. The latter is pivoted and operates the needle supply valve G in the usual way. Another noticeable point is the tube C, which is a preventive of strangling at low speeds. It keeps the mixing chamber H dry and free from fuel which would tend to condense the vapor generated. This tube extends into the manifold above the throttle and receives the full motor suction. The tube B is provided with an adjustment so that the fuel supplied at low speeds may be regulated. This device should furnish a well saturated mixture at normal operating speeds due to the opportunity afforded for the spreading out and fine division of the fuel.

Miller—Manually Controlled Valves

The new Miller carbureter is positively actuated, Fig. 20, being without springs. Pressing the accelerator pedal or opening the throttle controls the suction at the jet just as mechanically as it does the opening of the butterfly valve admitting the gases to the intake manifold. The carbureter, a concentric-float design with a single jet in the venturi, has a fixed air opening at the bottom of the venturi, and the air passing through this in connection with the jet in the venturi takes care of low engine speeds. When the throttle is opened further, speeding up the motor and causing a greater suction to occur at the jet, an extra supply of air is furnished in the following manner: Connecting the throttle butterfly valve and an air piston P in the cylindrical passage above the venturi is a short connecting rod R. When the throttle is opened, the piston is pulled up by this rod and uncovers air ports in the wall of the passage. The further the throttle is opened the more air ports are uncovered by the piston and the more air admitted.

In order to supply the increase in fuel necessary at higher speeds the needle valve is opened by the throttle mechanism through a cam arrangement on the head of the needle valve Q, thereby opening same through a spring in the needle valve housing.

Easy starting is obtained by a primer which depresses the float and floods the float chamber. The points at which the needle valve is opened and at which the piston begins to admit air through the annular auxiliary opening are adjustable. A removable hot-air attachment is also a feature.

Newcomb—A Constant Suction Type

A type of carbureter which works on the constant-vacuum principle and which utilizes a metering pin arrangement for automatically controlling the amount of fuel in the mixture is the Newcomb, Fig. 18. The metering mechanism is shown at B, while the pin proper which regulates the flow of fuel from the

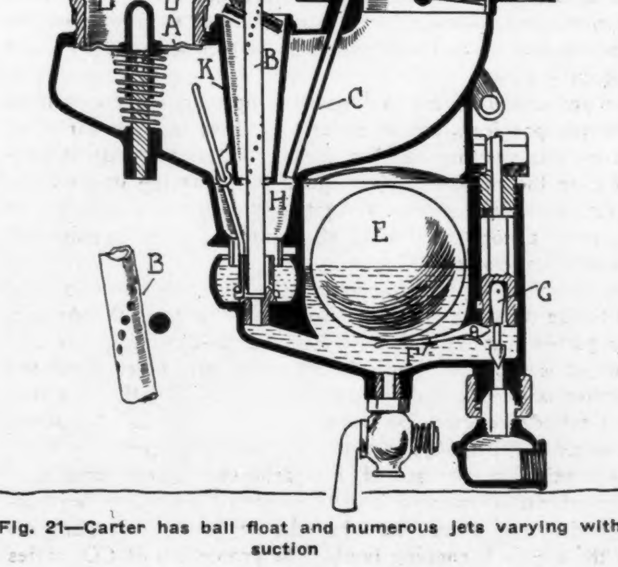


Fig. 21—Carter has ball float and numerous jets varying with suction

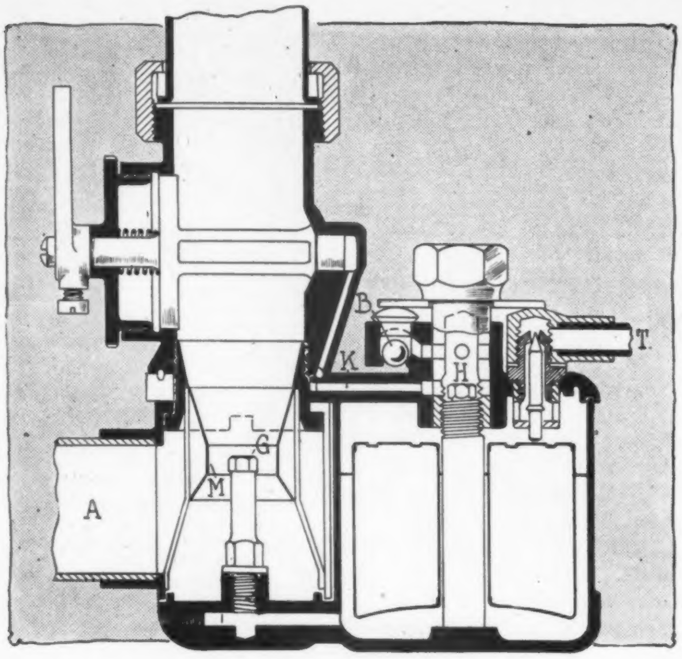


Fig. 22—Solex carbureter is a French eccentric float design

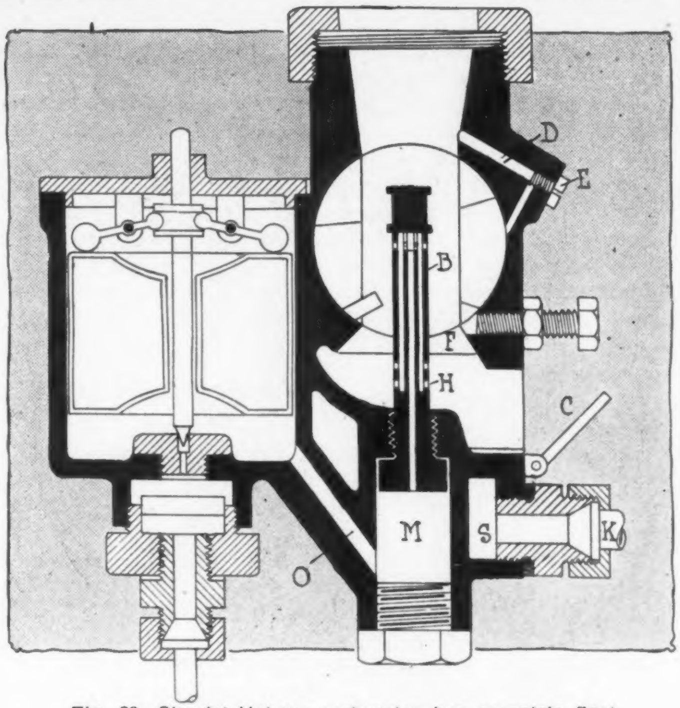


Fig. 23—Claudel-Hobson carbureter has eccentric float

nozzle C is indicated by A. This metering arrangement is really a small piston working up and down in the cylindrical body of the carbureter. When at its lowest position, B rests upon the upper edge of Y. In operation the metering mechanism floats in some such position as that shown.

Air enters through the bottom of the carbureter and flows through the slots S, the amount of opening of which is governed by the position of the plunger B. Holes H in the bottom of the plunger register with these slots S and allow the fuel issuing from the jet to flow through and combine with the air. The height of plnnger B is controlled by the throttle opening which increases or lessens the motor suction, and changing the pressure difference on the upper and lower faces of the plunger, that on the lower face is of course constantly atmospheric, being open and free.

Regulation for quality of mixture is done through the vacuum valve V above the float chamber. The valve V is so constructed that the flow of air from the outside may be increased or decreased by turning the valve up or down. The small passages are here shown wide open, allowing air to pass from the outside through the tube K to the mixing chamber. A tube L also connects this passage with the float chamber. When the valve V is adjusted for lean mixtures, it is screwed down so that there is little or no air passage to the outside. Thus when the motor suction becomes high enough, it draws through tubes K and L, communicating with the pressure above the gasoline in the float chamber and serving to prevent as great a flow to the nozzle, and making the mixture weak. When V is set for rich mixtures, the air passes directly from the outside to the mixing chamber and does not act against the flow to the nozzle, allowing proportionately more fuel for the same amount of air and giving a proportionately richer mixture.

This carbureter is fitted with a priming device for easy starting. It consists of an auxiliary fuel nozzle N connecting with a tube conveying gasoline from the float chamber. When the motor is running, very little fuel flows through this orifice, but when starting the throttle is turned backward through a slight angle, bringing it above the valve, and subjecting it to the strong suction which draws in pure fuel.

The float mechanism is standard and embodies the metal float F for raising and lowering the needle Q. For regulating the opening of the nozzle C provided by the pin A, the regulating collar V is provided, which raises or lowers the seating position of the plunger B. The needle is so positioned when normal that the fuel nozzle is nearly closed when plunger is on its seat, giving the fuel a slight lead over the air for slow running.

Claudel—Jet Inclosed in Tube

One of the foreign carbureters which has perhaps as big a European following as any is the Claudel-Hobson, Fig. 23, which has as its peculiarity the fact that its single jet H is inclosed in a small diameter vertical tube B perforated at the top and bottom. The throttle valve, which takes the form of a cylindrical shell or drum, is situated close to the jet, so that the valve practically takes the place of the usual choke tube.

The jet is covered by a tube B, as just stated, drilled at the bottom with holes H and also at the top at the same level as the jet. When the throttle is shut, the top part of the jet is in the mixing chamber and the gasoline is sucked through the top holes of the tube, while the suction is relieved by a proportionate quantity of air entering through the holes of the bottom of the jacketing tube, which is in direct communication with the atmosphere outside the regulator C, thus insuring a perfect spray and an accurate proportion of gasoline passing into the mixing chamber while the throttle and air strangler combined are so cut that, when opened to whatever extent, for the engine to pick up, accurate proportions of air and gasoline are claimed to pass into the cylinders.

Briefly, the action of the carbureter is as follows: When the throttle-drum is full open, there is a perfectly clear way through, so that the minimum possible obstruction is offered to the ingoing mixture, thus assuring as full a charge as possible. To further this end to an even greater extent still for maximum load that portion of the passage beneath the union-nut is tapered so as to gradually increase the diameter right through the throttle-drum and up to the induction-pipe fitting, while close beneath the throttle-drum is a sharper taper in the opposite direction, opening downwards, with the object of obtaining, injector fashion, all the flow that it is possible to get into the large bore of the induction pipe.

Projecting up into the throttle-drum, and therefore centrally placed within the main air passage when the throttle is fully opened, is the above-described special jet, in which the gasoline is maintained at an approximately constant normal level by a float of the usual character. Immediately beneath this jet there is a jacket through which some of the circulating water from the engine is allowed to flow, and which warms the gasoline before it actually enters the jet and assists in its atomization.

The shape of the throttle-drum already described is peculiar. The passage through it is such that the area round the lower portion of the jet is reduced at the same time that the outlet to the induction pipe is being diminished in size.

There is a small by-pass D which makes communication when the throttle is at a particular position, between the lower part of the carbureter and the upper part. The effective size of this by-pass orifice may be adjusted by means of the screw E, the end of which may be screwed so far in as to project across and thus restrict the lower part of the by-pass passage. A further adjustment is also provided by the screw which affects the richness of the mixture. When screwed out, the area of the choke tube is increased and the velocity of the air up round the jet is decreased. Though this adjustment makes but little difference when the throttle-drum is open, yet when nearly closed it becomes of considerable importance in regulating the air and fuel supply for slow running.

With this carbureter subsidiary warming is generally used.

Solex—Throttle Works Second Jet

The Solex, an imported carbureter of the twin-jet type, has the second jet in a most unusual position in that it is neither above nor below the throttle valve, located in the vertical pipe leading to the motor, Fig. 22, but, as a matter of fact, is precisely on the same level with this valve and enters the right end bearing of the throttle, which is explained as follows: The first or main jet G is of conventional construction and is surrounded by a bi-conical venturi M. Now for the secondary jet and its method of operation. To understand it, keep in mind that the throttle is capable of being moved axially by the simple expedient of screwing up or unscrewing the retaining cap, shown at the left end of the throttle. Between this retaining cap and the disk on the throttle shaft is a coil spring which aids in this adjustment. The throttle is composed of two thin walls inclosing a chamber and the pivot of the throttle on the right-hand side in the figure has a small hole in it; this hole communicates by means of the passages with a small chamber containing a ball valve B opening inwards towards this chamber. This same chamber has within it a supplementary jet deriving its supply of fuel from the main float chamber. These, briefly, are the constructional details, all of which are clearly shown in the illustration.

During slow running the throttle assumes a comparatively horizontal position. The induction current therefore passes through the crescent-shaped opening formed by the curved end of the throttle and the body of the carbureter. There is, then, in the float chamber formed in the throttle itself a depression intermediate between the extreme rarefaction in the region above the upper wall and the comparative absence of vacuum round the main jet below the lower wall. This depression is just sufficient to draw from the auxiliary jet the small amount of gasoline necessary to maintain a low rate of engine speed. The shut position of the throttle corresponds to a considerable angle so that no very nice adjustment is necessary for slow running; this adjustment is made in the first instance by operation of the screwed cap as just described. When the engine increases speed the depression increases and the small ball valve B lifts.

Hoyt—Metering Pin Regulation

The Hoyt carbureter, Fig. 26, operates on the constant-vacuum principle. It is provided with two jets, the low-speed jet A being adjustable for a fixed position while the auxiliary jet B is controlled by a metering pin mechanism C. The auxiliary needle has a long slim taper, but instead of being conical in form it is flat on three sides, the object of this being to produce three thin sprays, thus aiding in the splitting up of the fuel. This needle is raised or lowered by the plunger C, the amount which it is raised depending upon the suction; also the higher this plunger, the greater the amount of air passing through the auxiliary air valve E, which principle is similar to that of other metering pin types. The priming air passage supplies air to nozzle A when running at low speeds when the metering mechanism is seated is shown at D. Needle G controls a passage leading to the port F at the bottom of the air valve which when opened lowers the pressure under the valve, retarding its upward movement and thus putting greater pressure on the gasoline, making a richer mixture, the richness of which depends upon the amount G, is opened. In this carbureter the flow of gasoline is controlled by the air valve, a vacuum replacing springs.

Excelsior—Ball-Suction Control

A peculiar carbureter design which compensates for higher speeds by automatically admitting more air as the suction increases is the Excelsior instrument, Fig. 28. The distinguishing feature is the use of a ball B in the mixture tube. When the engine is running at low speed, the suction is small, hence there

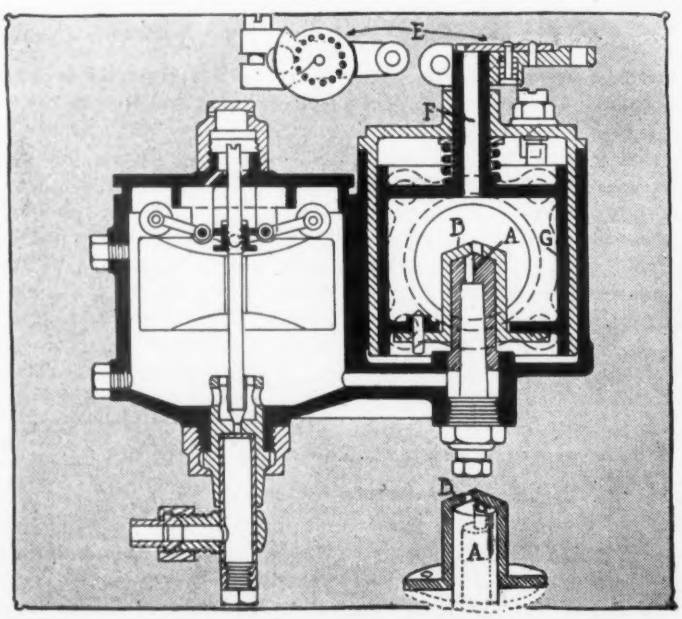


Fig. 24—White-Poppe is an eccentric carbureter with a variable adjustable jet

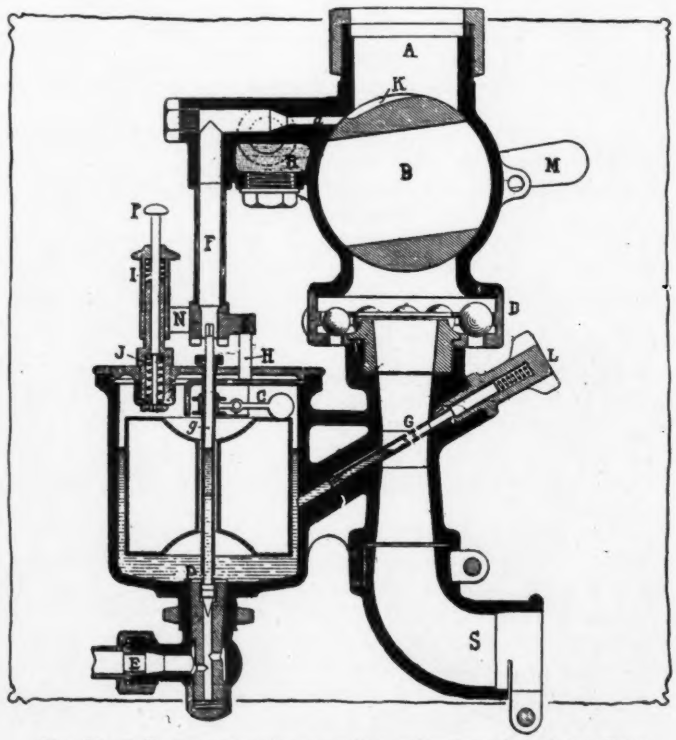


Fig. 25—G & A carbureter now has secondary jet above float chamber

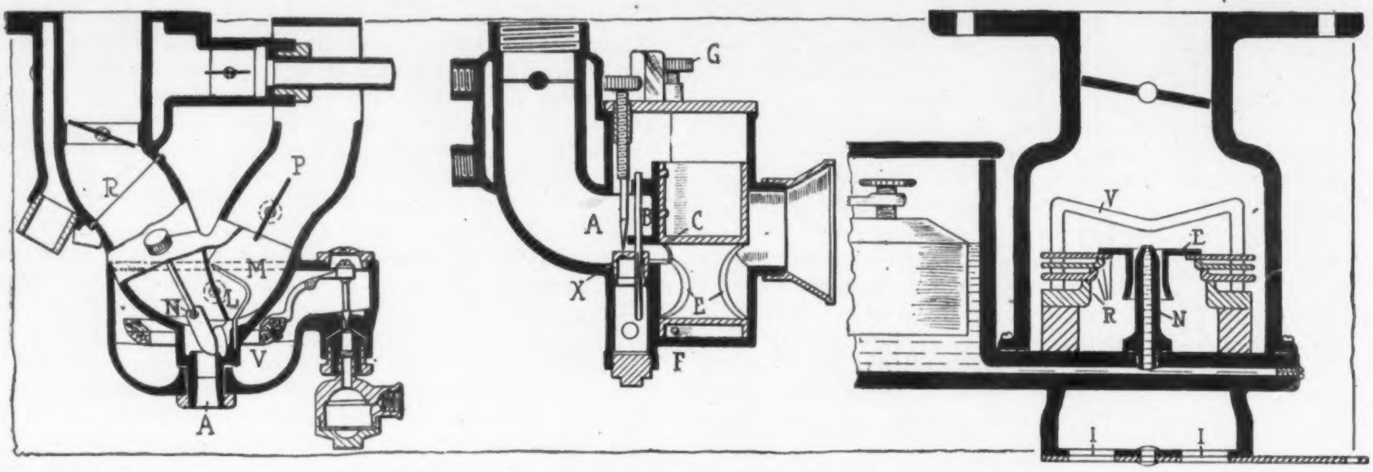


Fig. 26—Left, Marvel H with diagonal needle controlled jet; center, Hoyt metering pin control; right, Krause variable venturi eccentric carbureter

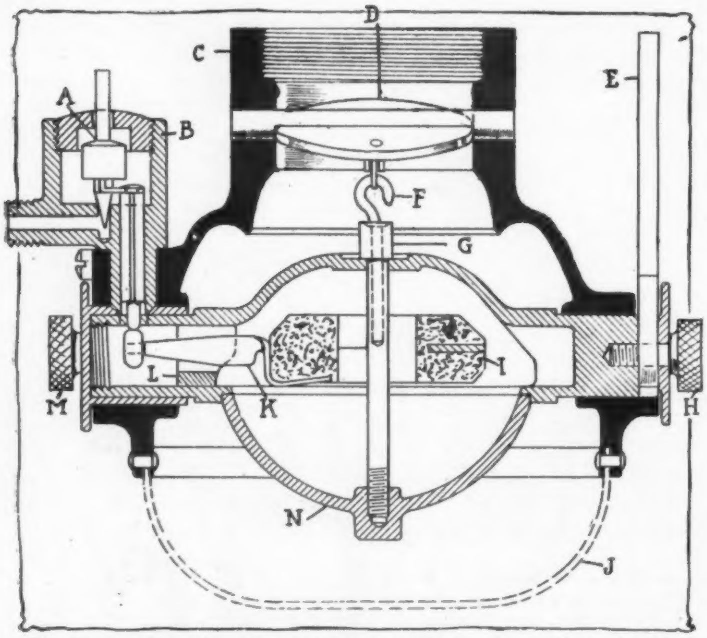


Fig. 27—A B C carbureter contains six jets in rotating float-chamber

is little tendency for this ball to be drawn upward toward the manifold connection. The tube becomes larger in section as it nears the manifold and is of the least diameter where the ball is shown. With increased vacuum, it floats in a higher position, as indicated by the dotted lines at C. In some such position as this, there is a wide passage for the air around the ball. Thus, the greater is the suction, the greater becomes the air clearance.

G & A—Adds a Two-Jet Model

The new Grouvelle and Arquembourg, or as it is generally called, G & A carbureter, Fig. 25, is of the eccentric-float, double-jet type. An unusual feature is that the auxiliary jet is concentric with the float while the main jet is set in a long venturi passage concentric with and below the intake manifold connection.

The normal air intake is located at S below the venturi and the jet is located at G at the narrowest part of this passage. As may be noted, the jet enters the venturi passage at 45 degrees. Additional air is obtained at greater engine speeds through the passages at D, closed by twelve metal balls of different sizes. This gives the required leaner mixture for intermediate speeds. At low speeds the auxiliary jet acts alone. The groove K in the throttle B allows the gasoline to be drawn up through the passage F. At the bottom of this passage the small auxiliary jet is located. It is indicated by G. Around this jet is an annular open passage through which air is drawn.

The priming device is shown at P, I and J. When the throttle is open wide enough for the main jet to come into operation the air is first taken through and then by lifting one ball after the other as the motor increases its speed. The course of the gasoline is through E, and though the usual form of float chamber P. The carbureter is hot-water jacketed at R.

A B C—Tilting Float Chamber

In the A B C carbureter a pivoted float chamber which rotates about a horizontal axis in conjunction with the throttle-valve action is the feature of the A B C carbureter. The latter is of concentric design. The float chamber is a flattened sphere suspended in the air passage; above the float chamber and situated in the intake passage in the butterfly throttle. The float chamber and throttle are linked together in such a manner that when the float chamber is tilted about its axis the throttle is opened. Piercing the wall of the float chamber above its equatorial line on one side is a series of five jets of different capacities and arranged at different heights; on the other side of the float chamber a single jet for low-speed and compensating work is located. When the float chamber is tilted, gasoline fills the jets one after another as the tilt increases; incidentally the throttle opening grows wider and wider. The more jets are opened the greater becomes the cross area of the air entrance around the float chamber.

C R G—Uses Three Venturis

The C R G carbureter is unique in that it contains three separate and independent venturi tubes in one casing, their relative location being such that if connected by lines, an equilateral triangle would be formed in the carbureter. Three jets or nozzles are used, each being located centrally in one of these venturi tubes. The concentric float chamber surrounds the three venturis. When running slowly, the smallest of the three venturis is in action and operates at speeds of from 4 to 12 miles an hour on level roads. Above the latter speed and up to 35 miles an hour the second venturi comes into action and works in conjunction with the first up to a car speed of 35 miles an hour. Above this speed all three jets operate. The air inlets for each of these venturis is separate and in order to get the gasoline started through the nozzle before the air comes into play a priming disk is fitted over each air passage.

White & Poppe—Eccentric Jet Control

The White & Poppe carbureter is of the single, variable-jet type and has a rotary throttle B working in conjunction with the jet-regulating device. The latest addition to the carbureter is a corrugated copper device for silencing the noise of the ingoing air. Fig. 24 shows a section in which A is the single jet having a hole drilled out of center into its main passageway. Fitting

gasoline-tight over the upright jet is a regulator cap B which has a hole of corresponding size and eccentrically drilled in its upper end. A rotary movement of the cap obviously has the effect of altering the effective opening of the jet. The regulation cap has a flange at its base by which it is attached to a cylindrical throttle valve S, which latter is operated when desired by the lever. The correct proportions of air to gasoline openings is in the neighborhood of 500 to 1, and the respective openings of the air throttle and regulation cap are arranged in such manner that their proportions are maintained at all positions of the throttle lever.

In the later type of carbureter an ingenious arrangement is furnished for varying the amount of constant air supply to the instrument. A hole F situated immediately over the jet is partially closed by a cam-shaped plate E. This plate can be lifted out of engagement with a small peg on the throttle lever and partially rotated so that the edge of the plate covers more or less of the constant air port F. In this manner an extremely fine adjustment is obtained. A small stop is provided close to the air inlet, known as the slow-running stop, for making it possible to instantly bring the throttle lever to the best position for slow running.

Krause—Maco—Marvel—Shain

Although conventional in most respects the Krause carbureter, Fig. 26, utilizes a method of controlling the air supply in proportion to the suction. The air enters through the bottom of the device through the adjustable air inlets I, and passes upward by the nozzle N. As the motor suction increases, the air controlling ring valves R are successively raised from their seats and slide on the guides V. Thus the air passing through is in proportion as the opening is made larger by the raising of these rings. When the engine is cranked, air enters only through the automatic priming valve E close around the nozzle, serving to draw enough gasoline for starting. The operation of this carbureter is a constant-suction type with what is in reality a variable air gap.

Extreme simplicity marks the Maco carbureter. It is of the concentric-float, fixed-venturi type. The air passes in through the bottom of the carbureter, up through the venturi and around the spray nozzle. A spring-regulated auxiliary air valve takes care of the mixture at increased suction due to higher engine speeds. There are two adjustments: The needle valve in the venturi jet may be regulated by turning the knurled screw above the carbureter and the tension on the auxiliary air valve may be regulated causing this valve to open earlier or later according as to whether the pressure is made higher or lower.

The use of more than one jet in an instrument assumes several forms; an unique adaptation being that shown in Fig. 26, which is a sectional view of the Marvel. This device is provided with a primary nozzle N which extends into the mixing chamber diagonally and which is controlled conventionally by a needle valve; and with an auxiliary or high-speed nozzle M which extends to the upper part of the mixing chamber and back of a butterfly valve L. This latter is held in a closed position by an adjustable tension spring. When the engine is running at high speed, the suction overcomes the tension in the spring and the valve L is opened admitting air through P in proportion to the opening and drawing auxiliary fuel through nozzle M which connects with the fuel chamber through the tube V. When the nozzle N only is in use, air enters through the fixed tube A only. The passage to the motor is at R. Float feed arrangements are in accord with American practice.

The Shain carbureter, Fig. 29, is distinguished by the fact that it has no float regulation but a ball B rests upon the gasoline supply pipe opening and is lifted from its seat by the pressure of the gasoline below and the suction of the motor above. Air is supplied through the ten open air ports surrounding the ball. The greater the suction of the motor the higher the ball will be lifted and the greater the amount of air drawn through the air ports. The ball revolves, owing to the suction above and the pressure below, giving a spraying action to gasoline.

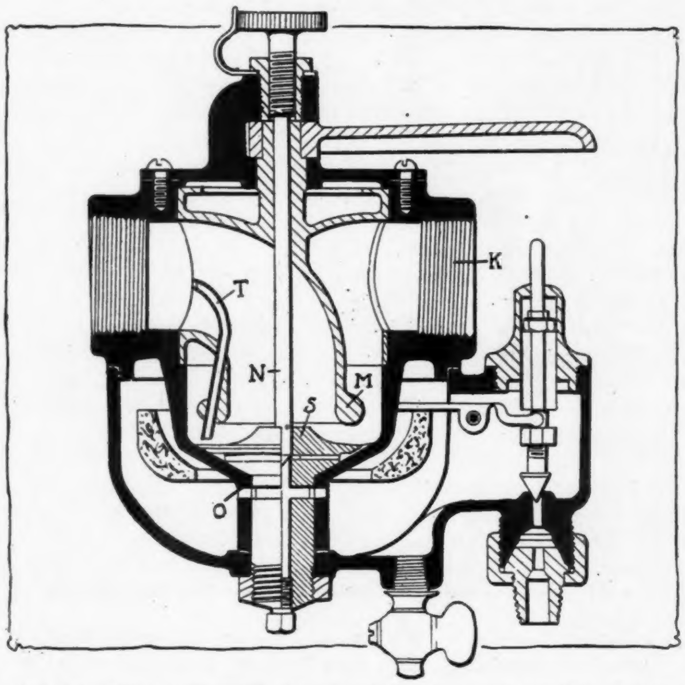
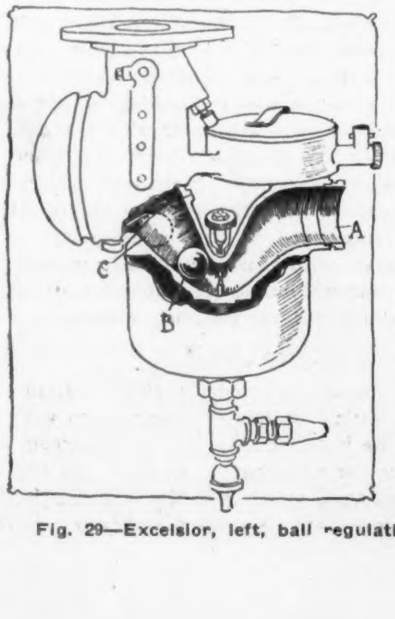


Fig. 28—Krice carbureter has no needle valve, but annular gasoline passage



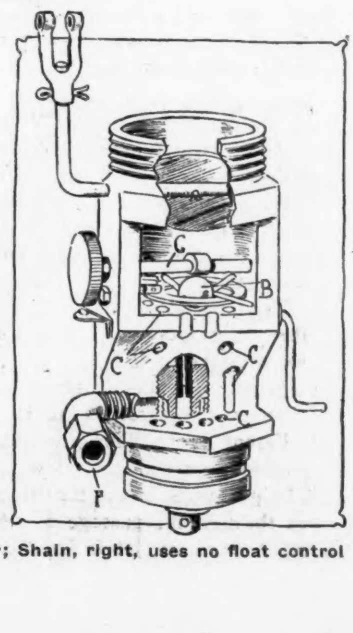


Fig. 29—Excelsior, left, ball regulating suction; Maco, center, concentric float, spring auxiliary air; Shain, right, uses no float control

Digest of the Leading Foreign Journals

Sudden Expiration of French Patents a Constant Danger to Some Non-French Holders—Odometer and Revolution-Counter of Interesting Design—Keeping Cars Young—Cheap Protection for Grade Crossings—Improvement of Road Tar

LAPSING of French Patents.—A recent decision in a patent case of the Thomson-Houston company against the street car company of Lille, France, rendered on appeal to the Court of Cassation by the latter calls attention to the risk of having their French patents declared invalid which confronts some non-French patentees and assignees.

The French patent law of 1844 says in article 29: "The author of an invention or discovery already patented abroad can obtain a patent in France, but the duration of this patent shall not exceed that of the patents previously taken abroad."

This paragraph is subject to varying interpretations. It is admitted that by virtue of this article the French patent granted for the same term as the foreign (non-French) patents is affected not only by the normal expiration but also by any accidental lapse of these patents, even if the cause of the voidance is not recognized in French laws. The Court of Paris found differently in a decree of May 16, 1863, in a case where a patent had become void in Belgium through failure to pay the required annual tax, but this decree was reversed by the Court of Cassation, January 14, 1864. It is held to be the purpose of the article to protect French industry and therefore not to permit a monopoly in France on something which can be manufactured freely abroad.

But what is to be understood by "abroad"? To cause the French patent to continue in force, is it sufficient that the invention is protected in any one foreign country? Or, on the other hand, is it sufficient, in order to cause its lapse in France, that its manufacture has become free in a single foreign country?

The natural sense of the article may be invoked in favor of the first opinion. Otherwise an inventor might find himself punished for his excess of precaution in taking out patents in all the countries of the world. Suppose, for example, that he takes out patents in the principal countries and also in Bulgaria. But after a year or two he abandons the idea of exploiting the Bulgarian patent and lets it go by default of payment. Should he then be deprived of his French rights, though he would have remained protected if he never had taken out a Bulgarian patent?

This consideration inspired the Court of Douay when on November 19, 1907, it rendered a decision in favor of the Thomson-Houston company.

The Thomson-Houston company had bought from Knight and Potter, the inventors, the French patent relating to a method for adjusting electric machinery. The method had already been patented in Sweden and in Belgium, but in 1907 the Swedish patent lapsed in default of the annual payment, and the street car company of Lille assumed that for this reason the patent had fallen into the public domain. In this the Court of Douay did not uphold it. Now, however, the Court of Cassation by its decree of November 5, last, has reversed the decision of the Court of Douay, maintaining that it follows absolutely from the purpose of the law that the French patent must lapse when any previously obtained foreign patent lapses for any cause.

This decree may be criticised for not interpreting the text of the law but the intent of the legislator and even for interpreting the latter incorrectly. The member who introduced the law of 1844 said in the Chamber of Deputies with regard to article 29: "We should not chain to a monopoly in France something which may be produced free of all restrictions everywhere else (*Il ne faut pas enchaîner en France par le monopole ce qui, partout ailleurs, serait libre de toute entrave*)." The words "everywhere else" conflict with the decree of the Court of Cassation.

At all events the applicability of this decree is now much restricted through the convention of December 14, 1900, in which there is found the following clause: "The patents demanded in the different contracting states by persons admitted to the benefits of this convention shall be independent of the patents obtained for the same invention in other states, whether these are or are not members of the union (*dans les états adhérant ou non a l'union*)." In accordance herewith, citizens of the countries which took part in this convention are no longer subject to seeing their French patents [or patents granted in any of the other countries interested.—ED.] suffer from the reaction of accidents befalling one of their other foreign patents. These privileged countries are numerous, including Belgium, Brazil, Denmark, Spain, the United States, Great Britain, Italy, Japan, the Netherlands, Portugal, Servia, Sweden, Switzerland and Tunis.

In the Thomson-Houston case the Court of Cassation disregarded this convention, although Sweden and Belgium are among the parties to it, because the facts of the case existed before the convention went into effect, which was in 1902. This shows the slowness of French legal procedure, since an action for infringement filed in 1903 and referring to facts antedating 1902, does not reach the Court of Cassation until 1912. It may be noted, by the way, that the case is not yet finished, as the Court of Cassation has remanded it back to the Court of Amiens. This, it may be hoped, will prove to be only a simple formality.—From *Le Génie Civil*, December 14.

[On the basis of facts presented in the foregoing it still seems possible that the American assignee of a French patent obtained from a Russian, a Norwegian, a Greek, an Austrian or a German patentee would forfeit his rights in France if any other patents secured by the inventor lapsed.—ED.]

NEW Odometer Principle Described.—The makers of the Gnome motors in France bring to the attention of the French industry an odometer which they have found very reliable in practice despite its apparently complicated mechanism in which the parts are small and delicate. The idea of the maker of this instrument seems to have been to avoid the use of a centrifugal governor in direct connection with the index hand which tells the speed variations and to measure the latter by bringing a roller which follows all the speed variations in a measurable and slowly self-adjustable relation to a disk revolving at a constant speed not too far removed from the average motor speed. The principle is explained as follows with reference to the accompanying diagrams, Figs. 1, 2 and 3:

The Behrens odometer is composed of two distinct mechanical movements whose interaction gives the number of revolutions per minute for any vehicle or motor. Where the driving shaft enters the device it transmits motion to both movements through a small train of gears, the ratio of which may be changed to suit the requirements in each case.

The first movement is shown in diagrammatic elevation in Fig. 1, and is intended to secure the rotation at constant speed of the disk D. The spindle of this disk is actuated by the driving shaft through a friction clutch T, which consists of a spiral spring whose free end expands against the interior of a drum, so as to permit small relative speed variations without slip. At the other end the shaft of D is geared to a small plate P, which turns with its spindle while capable of sliding in or out on it under the influence of a ball-governor which, at increasing speed, tends to draw the plate against the brake-screw B, which is mounted on a small leaf spring. The plate P is thus constantly in contact with the brake-screw, and the brake effect may be sufficient to make the clutch T slip. The disk D is hereby made to turn at constant speed.

The second movement, Fig. 2, comprises a metallic roller G, which is in frictional contact with disk D of the first movement and of an ingenious gear connection by which the roller is rotated from the main driving shaft of the device while yet permitted to take different positions in relation to disk D. It is this position which in each case is taken as the measurement of the motor speed. The roller gets into this position automatically by following the lines of smallest resistance in its frictional contact with the rotating disk D. The mechanism by which this result is obtained is as follows: The gear wheel R, driven from the main shaft of the device, actuates the wheel R1, which is guided by the radial arm V, and the latter can turn around the center O1. R1 meshes with R2, which controls the roller G. The arm V is connected by joints, not shown, with the sliding piece E, which is shaped somewhat as a tuning-fork and rides upon the spindle O of disk D. It is upon the unforked portion of this sliding piece that the roller G and wheel R2 are mounted.

Being thus free to move radially upon disk D, the roller will take the position in which its circumferential speed is the same as the linear speed of the contact point on disk D, in which position there is only rolling friction to impede its movement.

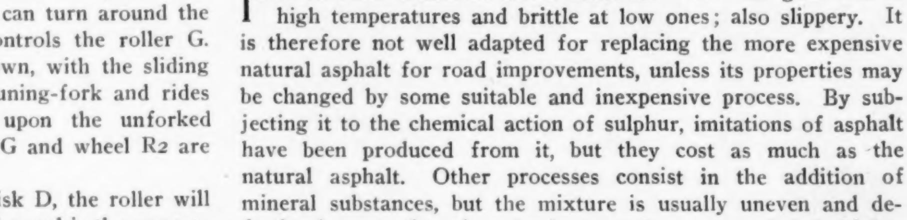
The position of the sliding piece is finally brought in relation to the index hand of the device by means of an arm with a toothed sector, on the plan shown in Fig. 3, the center C of this arm being chosen arbitrarily somewhere near the middle of the curve described upon the disk D by roller G.—From *Bulletin Officiel*, November.

DEVELOPMENT of the Schoop Method.—With a view to keeping automobiles and motor trucks, and perhaps especially taxicabs, constantly in commission, looking trim and new in spite of hard service, any process which holds out a promise of serving to keeping vehicles out of the paint shop engages the attention of the public at large as well as of the manufacturer. Among such processes that invented by Mr. Schoop of Zurich, Switzerland, for imparting a metallic surface to objects and substances of the most varied nature by blowing molten metal—especially tin, zinc or lead—upon them, holds a notable place, as it has already been employed in the manufacture of radiators, taking the place of soldering, and has been proposed for other uses to take the place of the electroplating bath, such as for forming water jackets, for coating gear blanks which are to be case-hardened in part and for producing a more substantial nickeling than is usually obtainable by electrolysis (owing to the development of hydrogen at the negative terminal). By the Schoop method as heretofore practiced the object to be coated was placed before a large funnel in which an exhaust fan caused a strong suction, and a spray of the molten metal was blown against the object, being carried in strong current of air or nitrogen taken from a reservoir under high pressure. The excess of metal was drawn in through the funnel and deposited in filters from which it was recovered. Similar methods have been used, at least experimentally, for plastering walls with cement or mortar.

Recently the same inventor has created a very light and portable apparatus which permits operating on any object at any place and without a complicated plant. It is in the nature of an oxy-acetylene gas torch and roughly resembles in appearance a Browning revolver connected by air and gas tubes with small compressor tanks. The flame of the gas torch is projected against the end of a stick of the metal with which the object is to be coated and, instantly melting this metal, carries it into the air, or nitrogen, current which carries it further onto the object, where it immediately cools and solidifies. Nitrogen takes the place of air in the case of metals which oxidize readily. As the cooling is mostly due to the rapid passage of the spray through the atmosphere the tool should be passed before the object at a certain distance from the latter in order to get the best results in each case. A small compressed-air transmission device advances the stick of metal in proportion as the end of it is consumed. Wood, cardboard, plastering, glass and metal can be coated in this manner, and the coating is at once hard and smooth. Its thickness can be varied at will, as the adhesion is perfect.—From *Génie Civil*, December 21.

IMPROVED Dustless Road Material.—Coal tar gets soft at high temperatures and brittle at low ones; also slippery. It is therefore not well adapted for replacing the more expensive natural asphalt for road improvements, unless its properties may be changed by some suitable and inexpensive process. By subjecting it to the chemical action of sulphur, imitations of asphalt have been produced from it, but they cost as much as the natural asphalt. Other processes consist in the addition of mineral substances, but the mixture is usually uneven and defective because the mineral substances by reason of their higher specific gravity have a tendency to clutter at the bottom of the mass. Admixtures of organic substances, such as pulverized charcoal, cork powder and sawdust, have resulted indifferently. But it has now been found at the Lindenhof Chemical Works that the tendency to segregation of mineral admixtures can be obviated if a vegetable and a mineral admixture are incorporated in the mass simultaneously. The physical action obtained by this means is that the organic substances coated with the tar resin hold the heavier mineral matter in suspension, and a chemical action is also effected, as the cellulose of the organic ingredients forms viscous compounds with the tar at the temperature at which the mixing is done.

The following is mentioned as a suitable method of proceeding: In a vat with a stirring mechanism 1,000 parts of tar are heated to 150 to 180 deg. C. To this there are added 200 to 300 parts of fine sawdust and 400 to 500 parts of ground chalk. Stirring is continued, without exceeding the temperature of 180 degrees, until the mass is homogeneous. Wood chips or shav-



Figs. 1, 2 and 3—Illustrating principle of Behrens odometer

ings may be used instead of the sawdust and marl or ashes instead of the chalk.

The viscous mass obtained can be run into molds and used like paving blocks or can be used directly in road construction. Like natural asphaltum it can be rolled, either cold or hot, into a uniform, coherent and elastic layer, if a firm foundation is provided and heated rollers are employed. The new composition is said to resist wear, heat and cold, undergoing no contraction in cold weather and being always impermeable to water, heat and sound.—From *Revue des Produits Chimiques,* December.

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FLASHLIGHT for Grade Crossings.—With the increasing amount of automobile traffic the old method of guarding the grade crossings of railways by means of a bar which is lowered at the approach of trains and from which a lantern is hung at night has proved inadequate; largely, so far as the night traffic is concerned, because the light of the lantern may be confused with other lights which are visible in the line of the street or road further on. Lights flashing 60 to 100 times per minute have lately come into extensive use in the railway signal service, and an adaptation of the same principle is now proposed for grade crossings. The light source in the apparatus offered for this purpose by the well-known Julius Pintsch company (originators of Pintsch gas) is acetylene gas dissolved in acetone and confined in steel bottles. The connection from this bottle, which is at the heavy end of the barrier, to the flashlight lamp, which is at the middle of the bar, as indicated in the accompanying illustration, Fig. 4, is by a single metallic tube, in which the maximum pressure from within the bottle, amounting to 15 atmospheres, is reduced to one-hundredth part of an atmosphere by a reduction valve system rendering the gas pressure uniform in the tube and at a small jet which burns only four-tenths of one liter of gas per hour. This jet is always lit, or may be lighted in the evening and turned off in the daytime, but the light from it is not visible. It serves only to ignite the flashlights, which are produced the moment the barrier is turned around its pivotal bearing to be let down, this movement opening a stopcock sending surplus gas to an intermittent-pressure valve in the lamp which the usual flow of gas to the lighter-flame is insufficient to operate.

Each bottle holds 650 liters of gas which, at the price of 3.50 mark per cubic meter, costs 2.275 mark for each filling. With flashes lasting one-quarter of a second and intervals of one-half second, the daily consumption of the flashes and the lighter is found to average 16.6 liters, at which rate one filling lasts 39 days. This brings the daily cost to 5.82 pfennig or about 1½ cents. Considering this low cost of maintenance, the device may be used both day and night, so as to save the much higher expense which would be incurred by providing for the lighting and extinguishing of the lighter flame. The main objection to the introduction of the device is of course that the railway companies would object to it because if—once introduced—it went out of order and an accident occurred, a suit for damage would be liable to go against them.—From Z. d. M. M. V., Dec. 15.

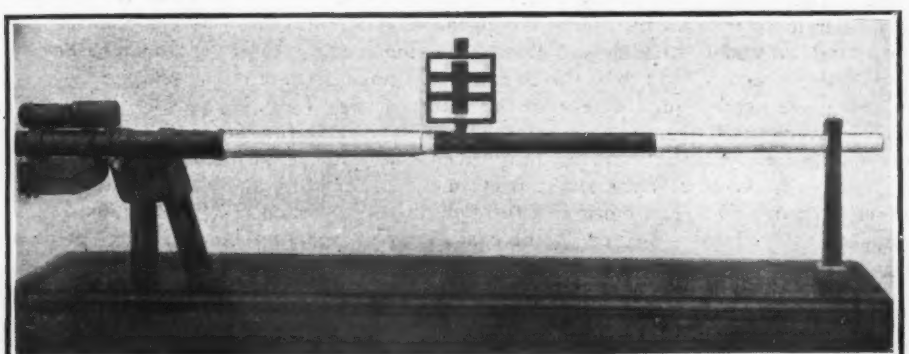

Fig. 4—Sample of flashlight barrier for grade crossings

STEAM Trucks in France.—Among the industrial motor vehicles shown at the Paris Salon last month there were two steam vehicle constructions which surprised many visitors, it being quite generally supposed that the gasoline vehicle had completely downed all competition. These were the Purrey and the Fodens. The Purrey steam trucks are very numerous in France and the power plant used in them, for which coke is the fuel, is the same that is used for the steam street cars in Paris. Their operating and maintenance cost per ton-mile is said to be interestingly low.

The Fodens steam trucks are of a very different type and are made for loads from 5 to 7 tons. They have fire-tube boilers and their engine actuates a flywheel from the shaft of which the power is taken to a differential on the rear axle by means of a reducing gear and a single chain. The low speed gear gives a maximum speed of 5 kilometers per hour and the high gives 11 kilometers. Either of them can be in mesh for starting, owing to the flexibility of the motor power. These trucks are equipped with sheet steel wheels.—From *Omnia,* December 14.

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Commercial Cost of Radical Change.—The net profits recorded for the firm of A. Darracq et Cie. at the last public accounting were only 18,300 francs, as against 1,824,225 francs the previous year. In order to pay dividends on privileged obligations, 3¾ per cent. on the common stock and the income tax of 500,000 francs imposed in accordance with the new decision of the tax commissioners, the company was compelled to take 1,250,000 francs from the reserve funds. While this unfavorable result of the year's business is in some quarters ascribed in part to the severance of A. Darracq from the company's affairs, the functionaries of the company ascribe it to the expenses incurred in manufacturing its new valveless motor, and they count upon recouping themselves through its success in the future.—From *La Vie Automobile,* December 21.

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American Engineers to Inspect German Plants.—The American Society of Mechanical Engineers will hold its next summer session in Leipsic, Germany, in common with the Society of German Engineers. About 200 American visitors are expected. It is the plan to inspect the industrial establishments of Hamburg, Leipsic, Dresden, Berlin, Dusseldorf, Krupp, Frankfurt, Munich and Nuremburg. Preparations are already under way for a festive reception.—From *Die Turbine,* December 20.

[The Society of German Engineers is very influential and counts more than 24,000 members. It has a large number of local branches which usually hold their business and social meetings at the most popular local hostelry, frequently under the eyes of the public.—ED.]

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Vibrations of Buildings.—With regard to the vibrations of floors, which interfere with the precision of machine work and in some instances with the health of workmen, it has been established through experiments with a seismograph that the operation of a motor in a building constructed entirely of reinforced concrete caused arcs of vibration in two contiguous brick buildings much larger than those observed in the building where the motor was installed.—From *Génie Civil,* December 21.

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Foreign Car Specifications—The seventh annual edition of the Catalogue des Catalogues has appeared containing specifications and prices of 2,000 motor vehicles, comprising motorcycles, side-cars, cycle-cars, automobiles, motor trucks and aeroplanes. Lefevre & Baron, No. 1 Avenue Félix-Faure, Paris, send it postpaid for 1.30 francs (26 cents).

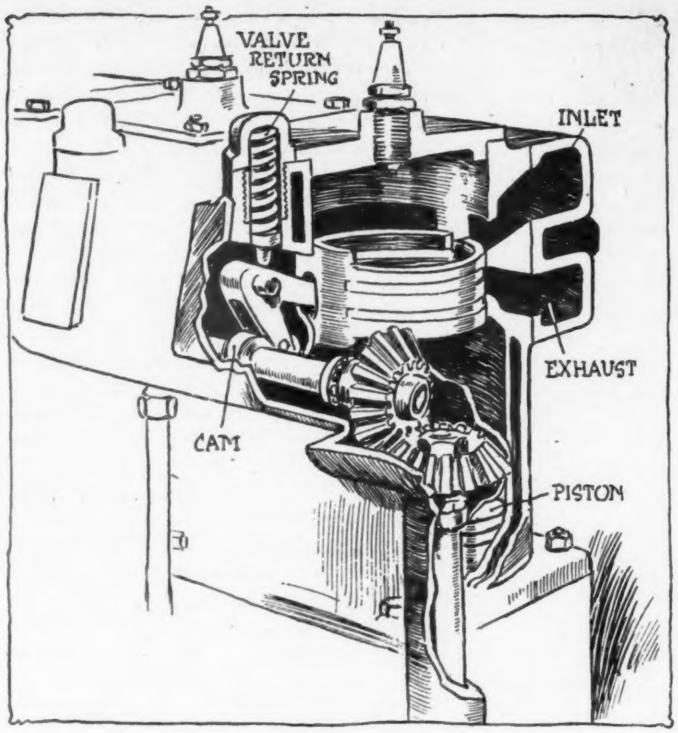

Fig. 18—Sphinx cam-operated sliding-valve motor

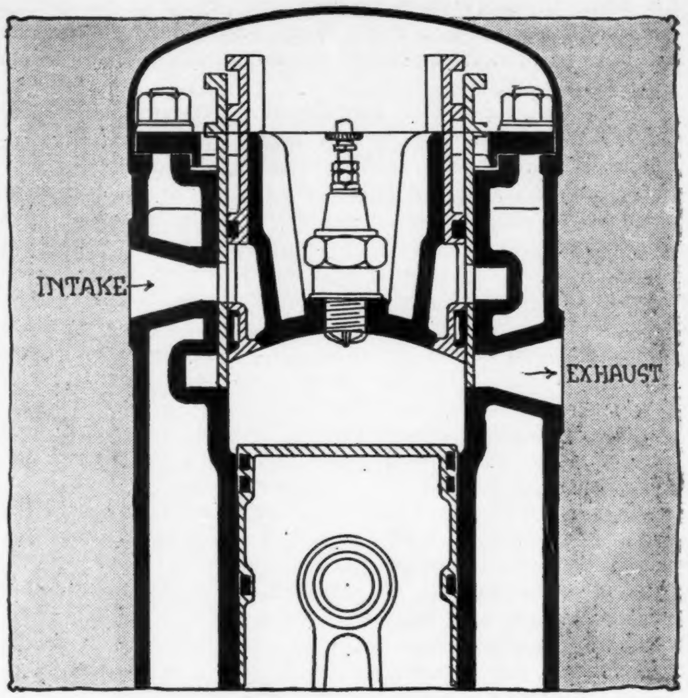

Fig. 19—Overhead sleeve-valve design by Crossley Motors

Criticisms of Non-Poppet Valves To-Date

Cam-Operated Sleeve Valves Have Harmful Effect on Valve-Tappets and Cams, Owing to Strong Return Springs—Laycock Motor Shows Good Scavenging Properties, Resulting in Strong Mixture

Complete Scavenging Produces Quicker Ignition and Combustion—Increase in Thermal Efficiency Over That Obtained with Incomplete Scavenging Should Amount to 25 Per Cent.

By Eugene P. Batzell Installment IV

SOME uncertainty of practical nature is attached to the motor, Fig. 21, in its cam-operated valve. The rest of the design deserves credit, being quite simple in its cylinder and valve construction. The overhead valve operation, permitting a short sleeve for the valve, removes the objections caused by the long sleeves of the type employed in the Knight motor, which objections refer to their manufacture, permanency of shape, lubrication, cooling, etc. The Diehl motor has a sleeve well separated from the cylinder interior, well balanced in regard to pressure and cooled all around. That being the case, the strain on the valve-operating mechanism ought to be small, much smaller than in an overhead poppet-valve arrangement, and therefore there is every reason for expecting a good performance by this motor in practice.

Other designers and inventors also have taken recourse to overhead sliding-sleeve valves with varying success. The Sphinx, Fig. 18, is one of these. This is its second improved form, the first being found unsatisfactory. Even this newer construction leaves much to be desired and in its idea it is inferior to that of the motor, Fig. 21. The slotted-sleeve valve of the Sphinx motor is exposed to the full pressure and temperature of the explosion chamber, the combination of which make sticking very likely, which must have been the makers' experience, because they have discarded the positive means of valve operation, adopting instead a cam and return spring arrangement as used with the conventional poppet valves. The principal advantages of a non-poppet-valve system is its positive valve operation, resulting in always equal valve motion regardless of the motor speed and in the general elimination of the noise, when the mechanism joints are tight. The Sphinx valve being exposed to sticking and also possessing much greater friction in its motion than the conventional poppet valve would necessarily require a very strong return spring if anything like high motor speed is expected with proper valve functioning. The poppet-valve spring must overcome merely the inertia of the valve and the slight friction resistance of the valve stem in its guide. The motion of the Sphinx valve is such that the exhaust port is opened by the cam action overcoming the resistance of the return spring and the friction of the valve against the cylinder walls, which is considerable, due to the valve being split. The return spring is determined also by the inertia and friction of the valve mechanism. The Sphinx valve weight is not less, but rather greater than the weight of the reciprocating valve parts in a poppet-valve motor; besides its valve

travel is longer than the lift of a poppet valve. As a result a much stronger return spring is necessary in the Sphinx motor than is used on the ordinary poppet-valve motor, and a more harmful effect on the valve tappets and cams would necessarily follow.

An example of valve design which differs in type from those already dealt with is a recent design by Crossley Motors, Limited, Fig. 19. The principle of the valves should be clear from the drawing, but their actuating mechanism is not shown so that it is impossible to say whether the valve motion is positive or actuating mechanism is not shown because it would permit to state if the valve motion is positive. Another departure from the usual type is the Brasier motor, Fig. 20, which has a main sleeve valve in its cylinder, which directly operates the exhaust, and in connection with a piston valve at the side of the cylinder operates the inlet. These two motors are merely referred to as examples, and as no practical results have been published in connection with either it is only possible to estimate their value from the drawings.

A motor with piston valves has some advantage over the rotary or sleeve-valve type inasmuch as its manufacturing is not rendered more complicated or uncertain on account of the valve system. On the contrary, the piston valve action being identical with that of the main piston there is no reason why equally simple machinery operations should not be proper for both places. Thus the valve mechanism here would be relieved of all the extra precision work which so far has been found indispensable in connection with the sleeve or rotary-valve manufacturing. The tight action of the piston valves being secured with the use of expansion rings no accurate fitting of the valves into their cylinders is necessary, which removes the main item causing trouble in non-poppet-valve systems, that is, heating and change of shape when a permanent good fit is essential. Of course, the piston-valve systems are executed with a great deal of complications in their operating mechanism, losing here in favor of the rotary-valve type. But, all things considered, they could easily prove some advantage over the sliding-sleeve valves, especially in engines where consistency of reliable service is the principal aim. This is apparently proven by the use of piston valves for some aviation motors. Both of these systems are identical in their operating mechanism, but the piston valves have a smaller surface requiring lubrication, they are generally lighter than the sleeves of the Knight type which would reduce vibration and wear in the operating links due to the inertia of moving reciprocating parts; their action is less liable to be affected by the conditions of motor functioning and temperature, etc., all of which tend to make them more reliable than the sleeve valves of the unprotected type as in the Knight motor. The above is not said with the intention of explaining my attitude for or against certain systems; it is based merely on technical comparison between them, and the Knight motor has been mentioned here frequently in drawing comparison merely because it is the most widely known of all the non-poppet-valve systems.

A most promising novelty in valve arrangement is offered in the shape of the piston-valve Laycock motor, Fig. 22. This motor, besides having valves of the variety which are balanced against the cylinder pressure in respect to their driving mechanism, incorporates a feature very little used or advanced in the field of internal-combustion motors, but which nevertheless deserves much attention. This is scavenging of the cylinders from the spent gases remaining there after completion of the exhaust stroke, which gases being mixed with the entering fresh mixture weaken it to a very great extent. There are a few other systems in existence which provide for scavenging, but they do not offer it in a combination of features as in the Laycock, the construction of which is practically not influenced by the added scavenging means and it can be carried out to suit the requirements of every case. Other scavenging systems impose some restrictions in this respect. In the Laycock motor the main cylinder has but a small clearance space at the piston top and the combustion chamber is divided into two parts formed by the space between the two connected pistons of each of the separate inlet and exhaust valves, individual ones for each cylinder. During the upward motion of the valves they draw into the space below their lower piston either fresh air from the outside or mixture though a by-pass to the inlet manifold and carbureter. When the main piston reaches the position, Fig.

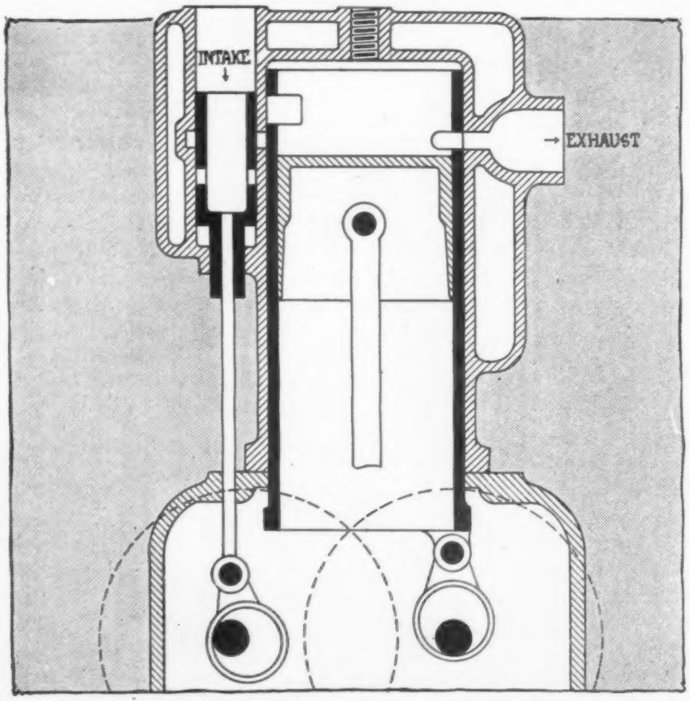

Fig. 20—Brazier motor using sleeve and piston valves

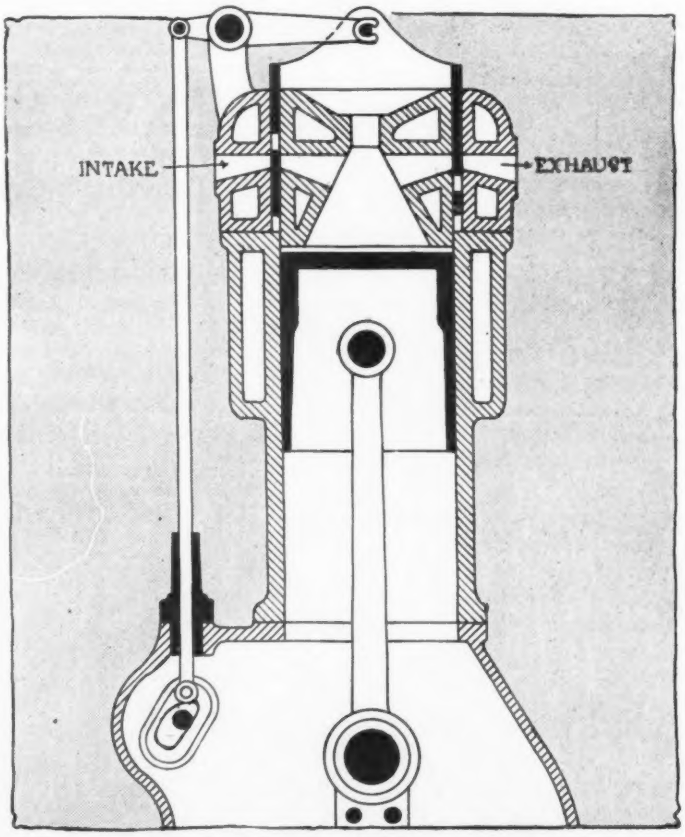

Fig. 21—Cam-operated overhead sleeve-valve of Diehl motor

22, that is, at the end of the exhaust stroke, the inlet valve is about to open the port leading into the cylinder to admit fresh charge from the manifold over the top of the upper valve piston. At the same time the space between its two valve pistons communicates through a by-pass with the compartment below the lower valve piston, the air or gas mixture in which was somewhat compressed during the downward motion of the valve. This air or mixture now rushes into the space between the two valve pistons expelling the spent gases from there into a passage leading outside. The action of the valve and the scavenging of the dividing combustion chambers is identical with that used in two-cycle engines for filling their main cylinder space, and consequently equal results should be anticipated. However, as in this motor only the volume of combustion space is cleared of spent gases the total rate of scavenging, considering also the piston displacement volume, is more nearly complete.

The exhaust valve acts similarly to the inlet valve only in advanced phase according to the timing. The exhaust gases from the main cylinder escape above the top of the upper valve piston, which piston overlaps the cylinder port just before the exhaust begins, thus separating the main cylinder from the space between the two valve pistons. The main cylinder space is cleared of gases by the returning main piston and the spent gases remaining between the valve pistons are expelled similarly as in the intake valves. The ignition of the charge takes place either by a spark-plug located in the main cylinder top or by plugs located in the two parts of the combustion space.

The section of the motor being very simple and identical with that found in other existing and well-proven types there should be little doubt as to its practicability. There are some points, however, about its construction which could be criticized and which would seem to require attention. The separated explosion chambers have an unfavorably large cooling surface through which part of the gain effected by scavenging will be lost. The burning of the charge between each pair of moving valve pistons will necessitate extra requirements for their lubrication because the oil film on the walls of this chamber are liable to burn out. The valve pistons should have lubrication rather from the inside than from oil which is supposed to cover the walls of their chambers. I cannot refrain from approving it in its combination of a simple non-poppet-valve scavenging motor.

Access with a scavenging motor inevitably would mark a big progress in the whole gas-engine field towards greater efficiency of their action. One could obtain high economy without excessive pressures on the working parts and without a mass of complication, which would be inevitable, for instance, when using an engine of the Diesel type to reduce engine of the fuel consumption, obtainable economy by scavenging is considerable and worth much attention. This way to reduce operative expenses of a motor deserves at least as much attention as trials to adopt the motors for cheaper fuel, especially because it can have beneficial influence on the motor action regardless of the fuel used. In my little experience with partially scavenging motors I was surprised to note the results witnessed in respect to the ratio between the explosion and the compression pressures; whereas a ratio of 3 to 1 is considered good in ordinary automobile practice when about 25 to 30 per cent. of the mixture volume is composed of spent gases, reduction of this latter content to about 18 to 20 per cent., but retaining the same rate of compression, was followed by an increase of the ratio between the mentioned pressures to about 4 to 1 and a little over.

The purer charge has much quicker ignition and quicker combustion properties. The absence of late burning results in a steeper expansion curve of the pressure diagram, which approaches the diabatic shape with a pressure volume exponent close to 1.4 instead of 1.3 as ordinarily. Thus relatively lower final pressure and temperature are reached when the exhaust starts. The relation between the higher initial temperature of expression and its lower final value indicate towards an increase of the thermal cycle efficiency amounting to 15 to 20 per cent. for the incomplete rate of cylinder scavenging as observed. Judging from this and as well from statements by recognized authorities a 25 per cent. gain of thermal cycle efficiency can be expected with complete scavenging. Accounting for some losses this theoretical figure might be reduced in practice to show a saving of about 15 per cent. in fuel consumption per power developed. In other words, it could also convey the meaning that with the same cylinder dimensions the scavenging motor would show some 15 per cent. greater developed power. These figures are well worth noticing and they should attract more attention to the scavenging high-efficiency engines than is now given them.

THE END.

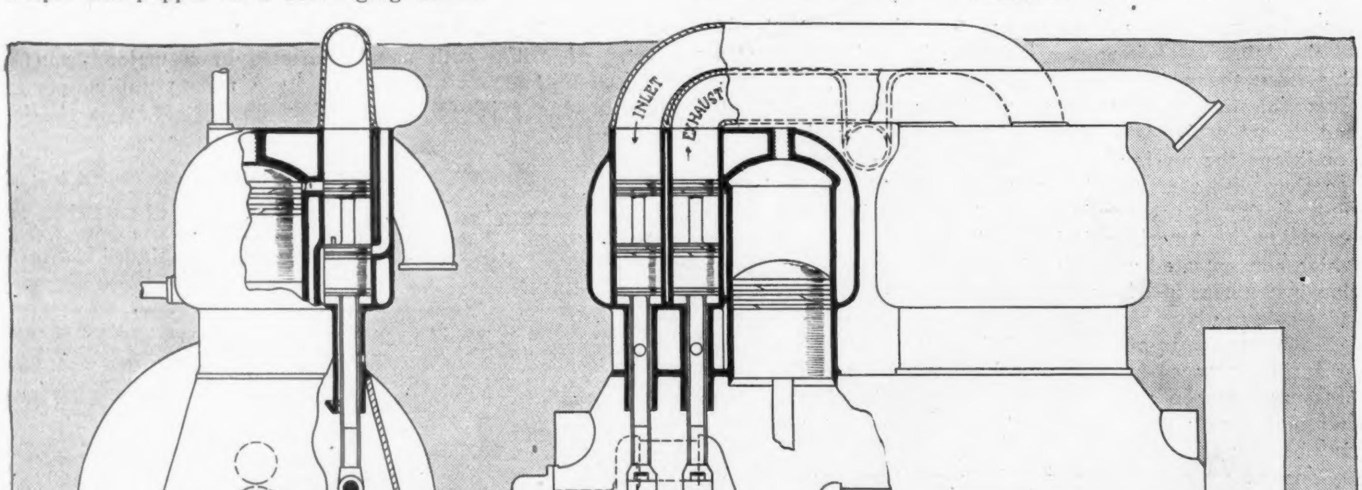

Fig. 22—Sectional views of Laycock piston-valve motor in which provision is made for scavenging

Carburetion

Part V

by ROBERT W. A. BREWER

Subject Digest

The principal difference between American and European carbureter design at the present time is that the majority of American makers are apparently partial toward the use of moving parts, whereas these are eliminated as far as possible in European practice. The American designer relies upon a suction-operated valve to control the supply of air, while the European pins his faith upon the system of compensating jets.

Controlling factors in the rate of discharge of the fuel from the orifice are the coefficient of discharge from the orifice, the pressure acting upon the orifice and viscosity of the fuel, which varies with the temperature.

Experiments have demonstrated that an increase of the water head above the normal 10 inches slightly increases the fuel discharge up to 16 inches of water head when the discharge increases rapidly.

The type of instrument which has a floating element supported in the air stream and actuated on the one hand by the engine suction and on the other hand by a spring or by gravity has come to the fore very much during the past few years.

CONSIDERING the modern carbureter designs in a broad sense we come to the conclusion that **one of the principal differences between the American and European carbureter consists in the almost general adoption of moving parts in the American design as distinct from their elimination in the European design. What the American carbureter manufacturer relies upon is some manipulation of the air supply by means of a suction-operated valve, whereas the European designer has a leaning towards the system of compensating jets.**

This generalization must only be considered in a broad sense because there are numerous exceptions on both sides of the Atlantic. Taking, for instance, the Holley instrument; this from the writer's point of view shows progress in the European line of thought as moving parts are eliminated and the jet orifice is so designed that under certain working conditions the air is allowed to pass through the jet orifice together with the fuel, thus retarding the flow of fuel when high suction is present in the body of the instrument. Of course, in the American design we have the school of thought which concentrated upon the development of a constant-suction instrument in which naturally a moving part has a very large rôle to play.

Moving parts, in addition to their having a spring-actuated or spring-balanced air valve working against a difference of pressure between the inside and the outside of the instrument, and, as an alternative, the weight of the part itself may be relied upon alone.

Consider for a few moments the controlling factors in the rate of fuel discharge from an orifice, and you find that these amount to the co-efficient of discharge of the orifice and the effective head or pressure acting upon the orifice. The viscosity of the liquid also must be considered, and this also varies with the temperature.

With regard to the question of moving parts, there is only one of these factors which requires our attention, namely, the co-efficient of discharge or jet friction, and we will proceed to consider how this behaves under working conditions with a needle type of control. First—Any orifice must be considered from the point of view of the relation between its area and its length.

Second—With regard to its shape: When the length of the orifice is great with respect to its area we naturally expect to find that the jet friction is greater, or, in other words, the co-efficient of discharge is less than would be the case when the area is greater or when the length is shorter. This we find to be most pronounced in actual practice, as will be shown in the table of figures following, from which it is evident that when the area of the orifice increases beyond a certain amount the characteristic curve of discharge droops, or practically ceases to rise with increments of area of orifice. At the origin end of the curve, that is, where the orifice gets very small with regard to its length, we again find another characteristic of the fuel discharge curve, which shows that when the suction is constant very small increments of area produce very small increase of this fuel flow. However, after a certain critical area is reached the fuel flow for a time increases in a straight line proportionately as the area of the orifice increases.

My experiments on various shapes of metering pins having a straight taper invariably show a characteristic curve of this nature which is somewhat curious. I have, however, found that when the active head has been increased above the normal 10 inches of water for which many instruments are designed, a fuel discharge of a different character takes place. Under these conditions almost the opposite effect has been obtained, namely, when the area of the orifice remains the same, the increase of head has slightly increased the fuel discharge up to a certain value, namely, 16 inches of water head, and after that the fuel discharge rapidly increases in the manner observed with a single round hole.

It will be useful, therefore, for us to consider a few values of flow of fuel in English gallons per hour per square millimeter of orifice with annular orifices of a major diameter of 3.96 millimeters operated on by a pin 24 millimeters in length when this pin is inserted to its full extent in the jet orifice.

Fuel Discharge Through Orifice Under 10-Inch Water Head			Flow of Fuel Through Brewer's Patent Orifice Under 10-Inch Water Head	
Area of Orifice Sq. Mms.	Flow of Fuel in Gals. per Hr. per Sq. Mm	Coefficient of Discharge of the Orifice	Area of Orifice Sq. Mms.	Flow of Fuel in Gals. per Hr. per Sq.Mm.
0.55	1.60	0.924	2.3	0.52
0.86	1.58	0.912	3.1	0.53
1.10	1.40	0.810	3.9	0.55
1.33	1.20	0.693	4.6	0.57
1.74	1.02	0.590	5.3	0.59
2.04	0.95	0.548	5.7	0.57
2.44	0.91	0.525		
3.22	0.88	0.507		
3.90	0.65	0.375		
6.20	0.60	0.346		

Furthermore, in this particular connection, we have the variation which can be caused by a choke tube either altering in its size or in its position with regard to the jet orifice. Taking, therefore, the most usually adopted moving

part in American practice, viz., the air valve, we will consider the difficulties in connection with a device of this nature when one attempts to carry out a theoretically perfect carburetion by means of this adjunct.

In the first place, there is the inertia of the valve itself to be considered, and, secondly, there is the spring-error, which is of necessity a feature of all spring-actuated devices, where it is practically impossible to obtain springs of the same nature which can be relied upon throughout their active life.

Springs which are used in connection with air valves are, as a rule, misused, and the more accessible they become the more they are liable to misuse in the hands of the driver or the owner of the car. Furthermore, it is practically impossible on the road to give an accurate adjustment of any spring-actuated device of this sort, although where the cost of gasoline is immaterial, a sufficiently satisfactory result can be, and is, obtained, in ordinary practice. There is, however, a certain period in the working of an instrument, viz., when the extra air valve begins to lift, where carburetion is bound to be momentarily upset due to the very great difference of prevailing conditions when the said valve operates or not, the effect of its lifting being a reduction in the vacuum within the mixing chamber.

It is probably owing to this reason that in carbureters where two springs of different strength are employed, the lighter comes into operation at the initial stage of the valve movement, and its resistance is supplemented by that of a stronger spring as the valve lifts from its seat as the suction of the engine becomes greater.

Now we come to the type of instrument characterized by a floating element supported in the air stream and actuated on the one hand by the engine suction and on the other hand by either a spring or gravity. Such a type of instrument has come very much to the fore during recent years, and it depends for its correct and satisfactory working to a very great extent upon accuracy of manufacture.

When quantity production is carried out, very great care must be taken with the accuracy of any instrument of this type, particularly with regard to the dashpot. Many of these instruments have given unsatisfactory results owing to the dashpot action not being as it should, and the immediate effect of any inaccuracy is that the floating element flutters to such an extent that the instrument absolutely refuses to work.

An instrument of this type in which the action of gravity comes into play has the following characteristics:

1—The inertia of the moving part due to the necessary weight which must be put into it, particularly with the larger sizes of instrument;

2—The effect of this inertia upon the working of this instrument as the car passes along rough or bumpy roads;

3—The liability to leakage of the air, or the effect of air leakage through the joints will naturally alter the depression within the mixing chamber for which it has been calculated; and

4—The leakage of fuel at the stem of the moving part where it is also assisting the dashpot action.

As an instance of the effect of an automatic moving part upon the depression in the mixing chamber of a certain instrument, the following observed values will be of interest: Weight of moving part, 1.5 pounds. Net area of part upon which suction acts, 4.1 square inches. Calculated depression, 0.365 pounds or 9.5 inches waterhead. Engine, four cylinders, 3 9-16 inches by 4¾ inches.

Engine R.P.M.	B.H.P. Developed	Vacuum Inches of Water	Lift of Part in Millimeters
500	8.25	11.0	2.3
1,000	19.5	9.5	4.
1,200	23.4	10.0	5.
1,400	25.9	10.3	6.
1,600	27.2	10.75	6.5
1,800	23.8	11.0	7.5

It will thus be seen that the moving valve regulates the depression with very fair accuracy, at any rate sufficient for all practical purposes.

Harking Back a Decade

FROM THE AUTOMOBILE, January 10, 1902:

A private speedway is being built through the pine woods about a mile north of Lakewood, N. J. It will be 1 1-4 mile long and will be for the exclusive use of members of the association although it is expected that it will be thrown open to the Automobile Club of America. The speedway is to be 80 feet wide. The team to represent America in the international cup race will probably be selected after a series of trials on the course.

Gasoline is now selling in Germany at 40 cents a gallon and lubricant brings $1.24 a gallon.

Methods of timing races used up to the present are inadequate. The famous error in the timing at Deauville last summer and the more recent disputes over times made in the Eagle Rock climb show that 1-5 second may measure the distance between the first and the last in a class of competitors. At 80 miles an hour a car covers 23.5 feet in 1-5 second and as the variation between two stop watches in any given event is rarely less than 1-5 second, the possibilities for error are apparent.

Tests to determine the personnel of the team to represent America in the Gordon Bennett race will be held April 11. The entries are as follows: Alexander Winton, H. S. Harkness, Percy Owen, L. P. Mooers, and C. W. Matheson. Albert C. Bostwick, Windsor T. White and Rollin H. White are prospective entries.

With 140 exhibitors, the third annual automobile show will be held at Madison Square Garden, January 17-24.

A new company to make gasoline engines, headed by Harold O. Smith and capitalized at $50,000 has been started at Indianapolis.

From Last Week's Issue

DEVOTED to the electric vehicle. Wholly electrified up to page 43 inclusive. Mainly descriptive of *status quo* 1912. Fine for reference. Keep it on file.

Did you notice that the power for electric vehicles, including self-starting facilities and lighting, inside and out, does not really cost anything worth mentioning—or at least would not in a socialistic state where only production cost counts—since it is only an off-hour by-product, wanted for no other purpose at the present writing, of the central light and power plant?

Did you notice—on page 23, for example—how boldly electric vehicle makers now place the batteries directly over the rear and front axles, where these supposedly tender mechanisms get just twice as much of a shaking every time a road obstacle is bumped as would be theirs if they were placed midway between the axles? Some argument in this for that silent advancement in battery robustness which distinguishes the vehicle of 1913 from that which scorched its brand onto public opinion way back in 1900—an advancement whose fault has been its silence.

And did you notice the bold and plausible claim made by nearly all contributors from the electric vehicle business, to the effect that no chauffeur is needed for an electric limousine? Quite a saving, if one would otherwise want a chauffeur. But we wonder a little if customers for electric vehicles will subscribe to it; whether it is a water-proof argument or one which will shrink and crock in the wash. The driving and the cleaning of any vehicle is in the long run a prosaic job, while there is poetry in a complete understanding of wonderful mechanism, as well as in several more utilitarian privileges of the owner.

The AUTOMOBILE

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The Car of 1913

THE pendulum is swinging backward. It is swinging backward to lower horsepower; it is swinging backward to fewer models, and it is swinging backward to fewer manufacturers. An accurate survey of the cars listed for 1913 points unmistakably to these facts.

The average horsepower of the various four and six-cylinder models is lower than it was last year, part of which is accounted for by the longer strokes and reduced cylinder bore, which strokes are not considered in calculating horsepower. But if horsepower is neglected and piston displacement taken as the criterion then, too, there is shown a certain reduction, which is chiefly so where new designs are brought out.

But our motors are still large, when contrasted with the European product. Some say we need the extra power because of the bad roads; but granting this there yet remains room for a reduction. When viewed in the horsepower scale the average American car is over 50 per cent. higher than the average European car, these figures being averages of all the listed models, regardless of the output. But we are coming down the scale and if the price of fuel continues to advance there will be some very perceptible reductions in the 1914 models. With the added efficiency that is being obtained from motors by changing valve timing, precluding dust from valve actuating parts, better balancing of crankshafts and reciprocating parts, improved lubrication and lighter-weight moving parts the maker is able to reduce the piston displacement and yet have more power or as much as he had with the larger cylinders.

We are slowly moving to the longer-stroke type. A retrospect over 1911, 1912 and 1913 models shows that the ratio of stroke to bore has been steadily climbing. The steps have been gradual. They are: 1911, 1.14 to 1; 1912, 1.16 to 1, and 1913, 1.22 to 1. This is slow but certain progress. But at this rate we are lagging behind continental practice, and while the average stroke-bore ratio for American cars for this year is 1.23 to 1 the average of the European models is 1.70 to 1. This year has witnessed a big gain and next year will record a still greater one. The square motor is now almost obsolete; it is approximately 5 per cent. of the entire models listed, and those motors under the square are but 2 per cent. of the total.

Nineteen-thirteen models listed record some forward steps that it is difficult to realize. One is the giant stature that the six-cylinder car has attained. There are not fewer than thirty concerns building only sixes. True some of these are obscure ones with small products, but their presence shows the country-wide ramification of the six-cylinder wave of popularity. All told, there are 120 different six-cylinder models.

It is but natural that at the inception of the six-cylinder car the motors should be larger than necessary, but there is a commendable reduction in sizes as compared with last year. There is an average horsepower reduction of nearly 6 horsepower in the average six of this year as compared with that of last year. When we measure the average horsepower of the American six with the average European six we find ourselves 16 per cent. greater, which is a better showing than in the four-cylinder field.

On every hand there are indications of myriads of engineering activities in the present models. Chain-driven camshafts are used by thirteen different companies, and it is certain that next season will witness a landslide to this method of drive, as has occurred across the water. Worm drive has inserted the thin edge of the wedge. Wire wheels are being clamored for by manufacturers, but the difficulty of obtaining them has restricted the listing of them as stock equipment to anything like the extent it is done in England and France. The block casting of motors has progressed by leaps and bounds.

Bodies have profited materially by the activity of the past 12 months. They are a little larger, for the sake of comfort, and the upholstery has been carried to its zenith. Doors are slightly wider.

Left-hand steering has increased to a 25 per cent. following. Larger tires are more general. And last, but not least, while the prices seem to be higher and are from \$200 to \$400 on the majority of the models, it is due to added equipment, so that the buyer is getting more for his money than he did last year.

Letters Answered and Discussed has been omitted from this issue, the space having been given over to the illustrated review of the year. This popular department of THE AUTOMOBILE will be continued next week.

Parcels Post Opens New Field for Trucks

House Delivery of Packages May Eventually Be Handled by Motor Vehicles—On R. F. D. Routes Efficiency Practically Demands Their Use

CHICAGO, Jan. 6—With the success of the new parcels post assured by the events of the first few days of its use, a new transportation has been born, destined to become a vast system of delivery covering the entire country, handling tons of merchandise a day, delivering house to house in every city and to rural communities, and employing for the work a large number of motor vehicles.

At the present stage of the parcels post the public seems to take it as a new kind of amusement, but with the passing of the novelty will come the serious aspect of increased business facility and a more efficient delivery of medium-sized parcels. It is a possibility that the parcels post system will more than double the amount of matter handled by the government in its mailing systems.

Tests made by the Chicago *Tribune* show that in the majority of cases the mails are quicker than the express companies. The *Tribune* posted twenty packages at 1 minute after 12 o'clock New Year's morning, the moment of the inauguration of the system, these being of various sizes and one to every zone of the parcels post system. At the same moment twenty similar parcels were given to the express companies for delivery to the same addresses. In each package was the request for a wire immediately on receipt of the package.

Out of all the packages heard from seventeen arrived first by parcels post and but three by express.

The list below gives the cities to which the packages were sent, the postal rate and the express rate, these figures giving a good idea of the relative cost of the two systems. Though figured from Chicago, the cost comparison is a fair average.

	Zone.	Express Rate.	P. P. Rate.		Zone.	Express Rate.	P. P. Rate.
Buffalo, N. Y.	4	$0.25	$0.14	Washington, D. C.	4	.25	.08
Fort Worth, Tex.	5	.25	.09	Washington, D. C.	4	.25	.26
Milwaukee, Wis.	2	.25	.10	Cleveland, O.	3	.25	.17
Boston, Mass.	5	.25	.09	San Antonio, Tex.	6	.35	.19
St. Louis, Mo.	3	.25	.07	Seattle, Wash.	7	.60	.21
Minneapolis	4	.25	.08	Atlanta, Ga.	4	.35	.14
Tampa, Fla.	5	.30	.09	Kansas City, Mo.	4	.55	.14
Toledo, O.	3	.25	.07	New Canaan, Conn.	5	.25	.09
Fort Dodge, Ia.	4	.25	.08	Emporia, Kan.	4	.25	.08
San Francisco	8	.30	.12				
Cincinnati, O.	3	.25	.07			$6.25	$2.48
Des Moines, Ia.	3	.30	.12				

A test conducted in the East gave the express a slight advantage. A package sent from Washington to the New York *World* by express arrived 27 minutes before a similar bundle sent by parcels post.

A number of enterprising firms used the new delivery for unique purposes, while many took advantage of the new possibilities to play jokes on their friends.

A Gary, Indiana, brick manufacturer deposited 6,000 bricks in the mails, and thereby obtained publicity enough through newspaper comment to pay for many more thousands of bricks.

The first parcel post package was received by President-elect Wilson. A local political club mailed a package of apples to Governor Wilson at midnight. By previous arrangement the regular letter carrier to the Wilson home was on hand and immediately carried the package to his destination by speedy motor car, delivering it to the President-elect at just 12:04.

A nameless brindle bulldog had the distinction of being the first canine that every traveled by post in America. He was delivered by post to a resident of Yonkers.

The first package received at Omaha contained two dozen eggs—nicely scrambled. A coffin was sent through the mails from the Zanesville, Ohio, post office, the cover forming a separate package. It is reported that nearly all of the downtown department stores of San Francisco delivered by parcels post the day of its inauguration.

A horned owl made its appearance at the Chicago post office January 2 en route by parcels post.

It will thus be seen that the possibilities of the new system are wonderful as allowing almost any kind of package under 11 pounds to be delivered. Books are excluded, however. In response to the new system, express rates on many classes have been more than cut in half to meet the government competition.

Packages cannot be deposited in the corner mailbox from now on as formerly. To prevent confusion tags were attached to Chicago package boxes reading as follows:

> **This Box for Printed Matter Only. All Merchandise Requires Parcels Post Stamps and Must Be Mailed at Postoffice or Carrier Station.**

It is probable that the house delivery of parcels will eventually be handled by motor vehicles entirely delivering even on rural free delivery routes.

Program of Business and Social Meetings to Be Held During the New York Show

Association Activities

Monday, January 13.—Meeting of the Executive Board of the American Automobile Association, luncheon 2 o'clock p. m., Belmont.

January 14.—Annual meeting Automobile Board of Trade, 10:30 o'clock a. m., headquarters.

Motor and Accessory Manufacturers, executive committee, 10 o'clock, headquarters.

Motor and Accessory Manufacturers, directors, 3 o'clock, headquarters.

Motor Boosters' Annual Beeksteak Dinner, Murray's Lyceum, 11 o'clock p. m.

January 15.—Society of Automobile Engineers, Standards Committee, 9:30 o'clock a. m., headquarters.

Motor and Accessory Manufacturers, Tenth Annual Meeting, 5:30 o'clock p. m., Waldorf.

Motor and Accessory Manufacturers, Fifth Annual Banquet, 8 o'clock p. m., Waldorf.

January 16.—Society of Automobile Engineers, Annual Meeting, 9:30 o'clock a. m., 2 o'clock p. m. and 8 o'clock p. m., ballroom, Hotel McAlpin.

Motor and Accessory Manufacturers, directors, 2:30 o'clock p. m., headquarters.

January 16.—Electric Vehicle Association of America, dinner in honor of W. H. Blood, Jr., retiring president, Delmonico's.

January 17.—Society of Automobile Engineers, professional session at ballroom, Hotel McAlpin, 9:30 and 2 o'clock and reception and annual banquet in Louis XIV dining-room at 8 and 8:30 o'clock.

January 18.—Society of Automobile Engineers, professional session, 9:30 o'clock, at McAlpin.

Social Features

Moon Motor Car Company, January 15, dinner to agents and guests at the Aberdeen.

Cadillac Motor Car Company, January 16, Hotel Astor, dinner to old guard.

Lozier Motor Company, customary dinner, Saturday, January 18.

Overland Company will keep open house throughout the week at the St. George.

Special entertainment will be given for the agents every evening.

Garford Company will maintain headquarters at the Breslin.

The New York Trade Association will hold meetings with the Boston Automobile Dealers' Association and a committee from the association will confer with the National Association of Automobile Manufacturers with regard to the second-nand car problem. A luncheon will be given in honor of the Boston dealers, date and place to be announced later.

Locomobile Company of America will exhibit its show cars in the local branch up to the time of installation at Madison Square Garden.

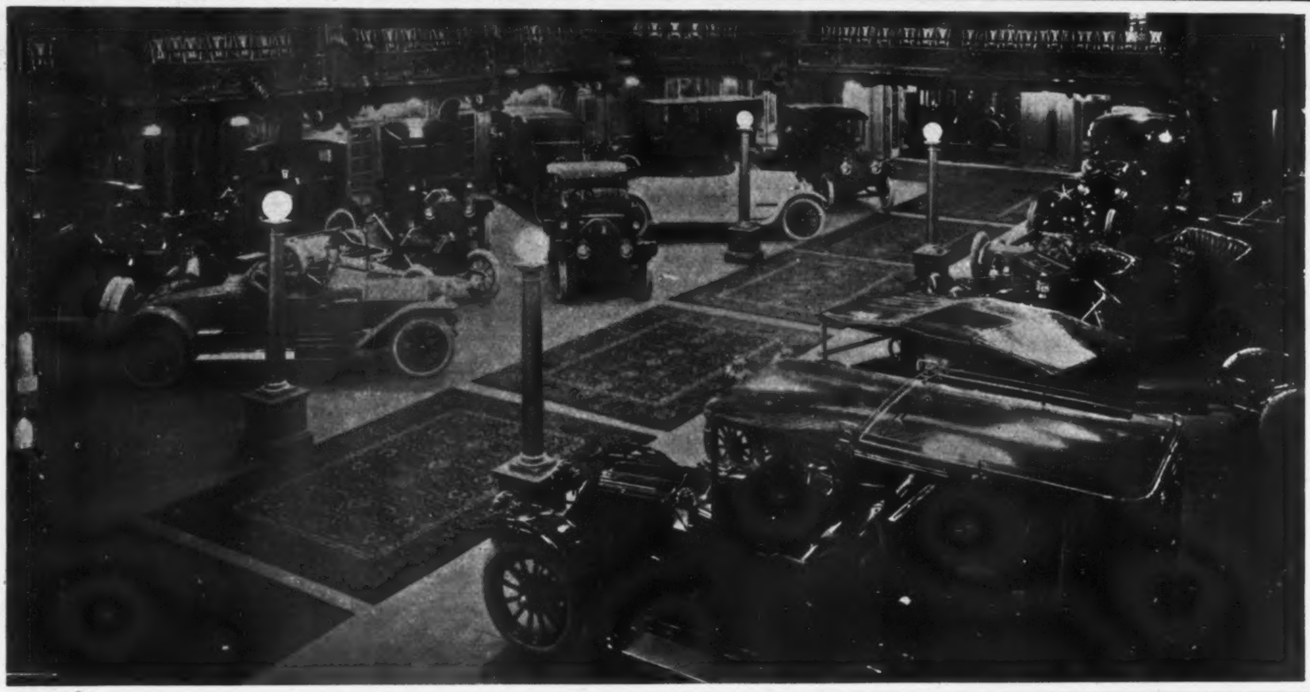
Packard Motor Car Company has not completed its plans for entertainment but a rather extensive program will be carried out.

The Peerless Motor Car Company will have headquarters at the Astor throughout the week and will show a chassis in the lobby. At the Waldorf the Peerless will show an inclosed car.

The Rauch & Lang Company will show a closed car in the lobby of the Waldorf.

The Winton Motor Carriage Company will give its regular family dinner during the show season, place and date to be announced later.

The Colt-Stratton Company will entertain the Cole agents as usual but the details of the program have not yet been framed.



View of the Importers' Salon as the display appears on entering the ballroom of the Hotel Astor from the corridor

Body Work Is Feature at Importers' Salon

Many European Developments in the Coach Builder's Art Shown—Nine Exhibitors Show Fifty-Three Cars and Chassis

THE thirteenth annual exhibition of imported cars now being held in the grand ballroom of Hotel Astor, opened on January 2 and will continue until January 11, the date of opening of the national automobile shows in Madison Square Garden and Grand Central Palace. The exhibit this year is made up of nine European makers, one Canadian and several American body builders. While in number of exhibitors the salon of this year falls somewhat behind that of a year ago, the models shown are representative of the European art and are 1913 productions in practically every case.

The concerns exhibiting are Renault, Panhard, De Dion, Mercedes, Isotta, Minerva, Metallurgique, Lancia and Austrian Daimler from across the ocean and the Keeton from Canada. The body building art is represented by Quinby & Company, Locke & Company, Healey & Company, and the Holbrook Company.

Fifty-three complete cars and chassis are on exhibition, the division being as follows: Limousines, 24; touring cars, 14; runabouts, 2; coupés, 2; landaulets, 7 and chassis, 4.

THE AUTOMOBILE has in its reports of the Olympia and Paris shows, written by its special representatives at these shows, described nearly all of the new models seen as well as illustrated them, and the repetition of another description is unnecessary, excepting where important features of design have been omitted.

The Importers' Salon is always welcomed by the American as it invariably gives new inspiration in body creations, and in this respect the present salon is not disappointing. Two interesting creations are one-passenger cars of the coupé class or the type intended for milady who prefers to go alone when shopping or calling. These vehicles of De Dion and Minerva make are very narrow, the seat being from 42 to 44 inches wide, not possibly allowing room enough for two. The interiors are lavishly finished, the Minerva interior being in hand-carved wood panels, with corresponding luxuries.

There is much versatility in body arrangements for touring cars, one of the leaders being a Metallurgique for seven passengers. The type is a stream-line torpedo. The driver sits in an individual-arm-chair seat, the seat to his left folds against the side of the body and has unusually heavy arm rests for comfort. There are two other folding seats, of the same type. The car has but one door at each side, which is nearly 50 per cent. wider than the conventional ones. There are not a few other examples of the very wide doors for touring-car models. The foreigner has made every effort to keep the rear of the chassis as low as possible and consequently the underslung springs are much more common. Electric lights are nearly general and a special lamp novelty is an Isotta model, in which the fenders are carried on the axles instead of on the frame and each front fender carries an electric bull's-eye. The fenders are very small and the general appearance of the car is considerably changed because of this.

One of the most novel body ideas is the Kellner convertible landaulet on a Panhard-Levassor chassis, which may be used either as a landaulet or as a five-passenger touring car.

The Metallurgique is also distinguished by its efforts in the line of body development. The leader in this respect is the above-mentioned seven-passenger touring car in which there is no partition between the driver's compartment and the tonneau. On this car, the bonnet is shaped with a noticeable convergent flare toward the front, ending in the V-shaped radiator.

The De Dion-Bouton has obtained a novel and pleasing effect by the use of a body border, similar to that introduced by the Alco company, but using instead of a white paint, wicker work along the top edge of the touring body.

One car shown for the first time in New York is the Austro-Daimler. The four motors made by the Austrian company are shown in the several leaders of its line, these being the Prince Henry, Alpine, 1911, and Alpine, 1912 touring body, mounted on 27, 32 and 80 horsepower chassis respectively. Another car on a 60-horsepower chassis completes the line. The Prince Henry type is undoubtedly the most striking representative of Austro-Daimler practice, being fashioned as a stream-line body and with a Metallurgique type of radiator. The other types of body are equipped with straight radiators. All of them are equipped with Bosch two-point ignition, force-feed lubrication and double-bevel shaft drive to the live rear axles. Two sets of brakes are used, the service brakes acting on the transmission shaft and the emergency brakes on the wheel drums. Four speed selective transmissions are used throughout the line of Austro-Daimler cars, and wooden or wire wheels are furnished at the option of the purchaser.

The Mercedes people have made few changes for the 1913 products. The old chassis are being continued, with such minor improvements as a double cone-clutch, a ring-sleeve air valve for varying the air admitted to the carbureter for a given throttle opening and a closer arrangement of the double sets of spark-plugs in their cylinders than has been used heretofore. Furthermore, an air-pressure regulating valve which formerly was carried on the front of the dashboard, is now in place between the latter and the radiator, being thereby made more accessible than before.

The Canadian Keeton car is practically identical with the product built in the United States under the same name. A six-cylinder motor, rated at 48 horsepower but delivering 61 in the dynamometer test and well nigh 70 at the brake, is used in both the seven-passenger touring and the roadster model. The wheelbase is 136 inches with 37-inch wheels in the rear and 36-in wheels in front. A Renault type of hood is used and no starting crank is attached to the front of the car, due to the application of a Jesco electric starter.

Panhard & Levassor exhibit 20 and 30-horsepower cars of the Knight type. In all other respects valveless and poppet-valve motors are alike for both sizes of chassis. The Knight lubrication system has been improved upon by the use of an automatic circulating, non-mechanical oiler working as follows: The oiler consists of a reservoir the outlet of which is governed by a needle valve regulating the passage to the highest crankchamber trough, from which the overflow passes into the next trough and so forth. The oil splashed up by the scoops of the connecting-rod end in the fourth trough returns to the reservoir by its momentum and after being strained is recirculated

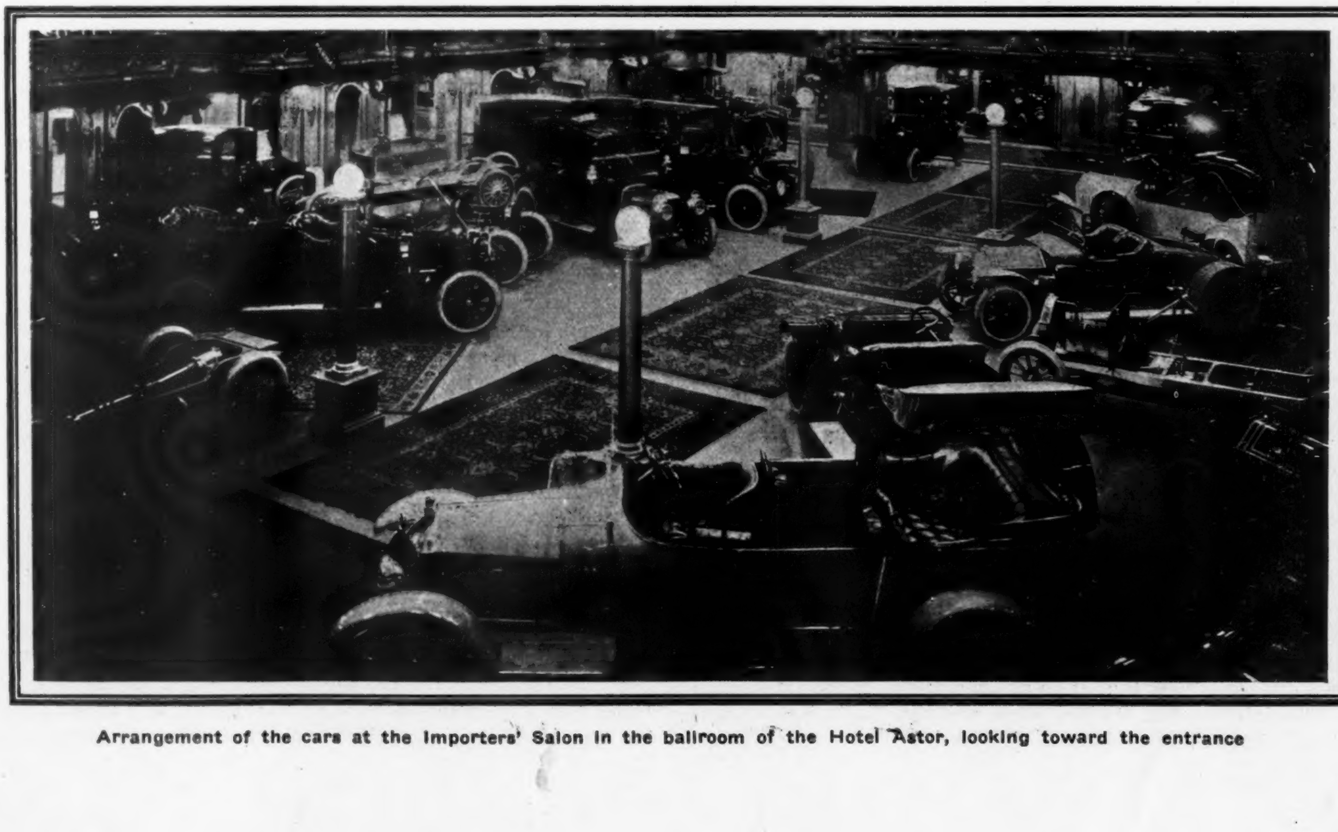
Four De Dion chassis, the 10-16, 30, 50 and 100, are shown. The De Dion-Bouton product having been described in a recent issue of THE AUTOMOBILE, only the chief new features are mentioned here. These are the use of a worm drive between shaft and differential, the standard wire-wheel equipment, Vesta lighting dynamo, set-spark ignition and the carrying under the dash cowl of the gas tank on the 10-16 model. The clean dashboard is a special feature this year.

Renault automobiles for 1913 are built on nine chassis, ranging from 9 to 60 horsepower and equipped with a variety of body styles, including touring cars, limousines and landaulets. Two chassis are also shown. The mechanical developments incorporated in the Renault cars are as follows: The cylinders are offset and the valves are mounted at an angle to the cylinder axes. A Bosch automatically timed magneto is used. The suspension has been developed to an underslung, semi-elliptic system in the rear, instead of the former three-quarter elliptic springs. Renault detachable wooden wheels are standard.

Minerva cars, made in Belgium like the foregoing product, are made in four chassis sizes, namely, 14, 18, 26 and 38 horsepower. The Knight motor has been continued in these cars without changes, and the use of a large bevel gear in driving the differential is the principal mechanical feature. Only the small model uses the worm drive.

The Isotta-Fraschini company is represented by two chassis and several complete cars, every type made by the company being shown. There are six types altogether: the 14-18, 18-25, 25-35, 70-80, 35-45 and 120 horsepower motor chassis, the last two of which have the cylinders cast in pairs, while the others are block castings. The mechanical features of 1912 have been retained for this year.

Two Lancia models, the 20 and 30 horsepower cars, are shown at the Salon. The motors are 3.14 by 5.11 inches and 3.93 by 5.11 inches, respectively. These motors are operated at higher speeds than former models and are cooled by larger radiators. The motor compartment is closed up against the dashboard by an aluminum plate which protects the wooden board from the heat.



Arrangement of the cars at the Importers' Salon in the ballroom of the Hotel Astor, looking toward the entrance

Savannah Gets Big Races

Vanderbilt Cup and Grand Prize To Be Held on Last Year's Course Shortened to 14 Miles

Milwaukee, Determined Not To Be Outdone, Will Make the Pabst Trophy an International Event

SAVANNAH was awarded the running of the next Vanderbilt Cup and Grand Prize races at a meeting of the Motor Cups Holding Company this week. The races will be staged on approximately the same course as in 1911. It is likely that it will be slightly shortened but will be about 14 miles in length.

The races will be run some time between November 1, 1913, and February 23, 1914, but according to Henry Sanderson of the Contest Board of the Automobile Club, of America, it is likely that they will be staged about Thanksgiving Day as usual.

No other applications for the races were formally considered although it was stated that the New York dealers and the Milwaukee Automobile Dealers Association sought to secure the races.

A large delegation from Savannah, representing the local automobile club and various civic organizations waited upon the cup committee and presented the claims of the southern city. Harvey Granger, president of the Savannah Automobile Club was spokesman.

All the details of the Grand Prize race have to be submitted to the Automobile Club, of America while the American Automobile Association has the sanctioning power with reference to the Vanderbilt Cup.

Mr. Granger reported to the committee that the old course is in excellent condition and could be put in shape for the races in 48 hours.

Milwaukee to Run Pabst Anyway

MILWAUKEE, WIS., Jan. 8—Failure of Milwaukee to secure the Vanderbilt Cup and Grand Prize race has led the local automobile enthusiasts to the determination to make the Pabst Trophy race an international event with large cash prizes to be offered. Already negotiations have been opened with the Elgin authorities looking to two race carnivals for August and September.

Tetzlaff Falls Under Official Ban

LOS ANGELES, CAL., Jan. 6—The race meeting just held here will prove of much more interest than the running of the events seemed to warrant because it means the suspension of Teddy Tetzlaff by the American Automobile Association; Barney Oldfield may be permanently barred and a new association known as the Western Automobile Association is in a state of active insurgency against the A. A. A. The Western Automobile Association is at present confined to Los Angeles and vicinity as San Francisco and San Diego so far have refused to affiliate with it.

Tetzlaff's suspension was automatic under the rule that prohibits exhibition and participation in unsanctioned events.

Fiat Wins San Diego Road Race

SAN DIEGO, CAL., Jan. 1—The first San Diego road race, two laps around a course extending through the hills and along the coast, for a distance of 190 miles was won today by Walter Hill in a 120-horsepower Fiat at an average of 57.1 miles per hour.

The finish was at Pacific Beach and Hill finished 10 minutes ahead of Smith in a Mercer. Considering the mountain grades and the winding road, Hill's time of 3 hours 59 minutes and 36 seconds was very fast.

Hardly less remarkable was the showing of W. H. Smith and his little Mercer. W. H. Carlson, Jr., driving the Stutz No. 20, after he had been given up as out of the money, came to the front and won third place. Smith's time was 4 hours, 12 minutes, 12 seconds; Carlson's time was 4 hours, 16 minutes, 15 seconds and Louis Nikrent, Buick, who came in fourth, made it in 4:48:09.

Broken springs and radius rods were mainly responsible for Bob Burman's failure to place. Spider Campbell had engine troubles and quit at the finish of the first lap. C. A. Conant's National went into the ditch at Encinitas on the first lap and broke a wheel. Al Lambis, in a Columbia, was thrown out of the running after finishing the first lap. The steering gear gave out on Torrey Pines grade.

More than 100,000 people lined the sides of the road on which the machines traveled.

Galveston to Offer $25,000 for Races

GALVESTON, TEX., Jan. 6—Plans for what is already assured of being the biggest automobile race meet ever held in the south, with cash prizes totaling $25,000, are well under way under the leadership of Captain J. W. Munn, chairman of the Beach Course Race committee of the Fifth Annual Cotton Carnival. The plans which have been set in motion are sanctioned by the Galveston Commercial Association and have also been indorsed by the most prominent business and professional men of the city.

The big race meet will be held in August during the Cotton Carnival days, tentatively set for August 7 to 16 inclusive, during the 10 days of which there will be 5 devoted almost exclusively to the automobile races, the races being held every alternate day of the 10, as it is thought the best results and attendance can be secured in this manner.

Now that everything is in readiness for announcing the dates and events of the race, Captain Munn has inaugurated a movement which should result in the establishment of a permanent fund for automobile races at Galveston. He with his committee secured enough money to erect a long string of permanent grandstands and seats, also have fenced off the 5-mile straightaway race course and have prepared 5 additional miles so that 10 miles straightaway may be run if desired.

Two Stutz Cars in 500-Mile Race

INDIANAPOLIS, IND., Jan. 6—To the Ideal Motor Car Company, of this city, belongs the honor of making the first entries for the 500-mile sweepstake to be held on the Indianapolis Motor Speedway, Memorial Day. Two Stutz cars have been entered and Charles Merz and Gil Anderson nominated to drive them. Anderson and Merz are two of the most consistent drivers in the racing game and have made an excellent showing with Stutz cars wherever they have driven.

The Speedway management has announced that the prizes for the 500-mile event will aggregate $50,000, the same as last year, but that they will be divided among ten drivers instead of among twelve drivers as in 1912. The prizes will be as follows: First, $20,000; second, $10,000; third, $5,000; fourth, $3,500; fifth, $3,000; sixth, $2,200; seventh, $1,800; eighth, $1,600; ninth, $1,500, and tenth, $1,400.

Paul R. Martin has been appointed general press director of the Indianapolis Motor Speedway and of the Ocean-to-Ocean highway movement. He succeeds Homer McKee. Mr. Martin came to Indianapolis 5 years ago.

A Correction—In the description on page 113 of the Correja car it should be stated that this company will make only sixes. The bore and stroke of the motor described should be 4 by 6 inches. An Eisemann magneto, electric lighting and starting and full equipment are among the prominent features.

Gotham Raises Limit

Aldermen Pass Ordinance Increasing Maximum Speed Permissible in the City to 15 Miles An Hour

Penalties Provided Are Severe, Being Graduated as to Number of Offenses—Owners Responsible

INCREASING the speed limit for automobiles to 15 miles an hour and increasing the penalties for violation, the aldermen of New York have passed an ordinance doing away with the ancient law that made 8 miles an hour the speed limit in New York. On certain much used automobile thoroughfares of Harlem and the Bronx, the limit is set at 18 miles an hour. In certain highways in Brooklyn and Queens 20 miles and in outlying sections 28 miles. The old law has been a dead letter almost from the time of its enactment and much uncertainty existed in the minds of the general public as well as automobilists as to traffic rights.

Offenders are to be punished on a graduated scale. For first offense the penalty is a fine of $25 to $100 or 15 days in jail, or both; second offenders within a year, fine $50 to $100, or 30 days or both and for third and subsequent offenses, $100 fine or 60 days or both.

Owners riding in automobiles at the time of breaking the speed law, are deemed liable to punishment provided for misdemeanors.

The law goes into effect March 1. The vote upon it was unanimous.

Fire and police automobiles, United States mail vehicles and ambulances are excepted from its operation.

Gramm Output to Be Increased

LIMA, O., Jan. 6—At the annual stockholders' meeting of the Gramm Motor Car Company, of Lima, Ohio, which was held recently after being postponed from September 10, steps were taken toward increasing the output of the plant to a large degree. It is planned to build 5,000 trucks during the coming year and to bring about that change it will be necessary to employ 700 men instead of 275 as at present. Additional space will be secured.

The announcement has been made that Thomas M. Conroy, of Elmira, N. Y., has been made superintendent in the place of Michael Coakley, resigned.

Officers elected were: John N. Willys, president; G. W. Bennett, vice-president; J. E. Kepperly, secretary; Walter Stewart, treasurer; J. N. Garver and H. K. Hocke, general managers.

W. A. Redding Signally Honored

William A. Redding, chief patent counsel of the Automobile Board of Trade has just been elected president of the General Alumni Association of the University of Pennsylvania which has a membership of about 20,000. The university ranks as third in the United States. The new president has announced that he is in favor of forming a cohesive body, including all graduates of the institution, to exert a powerful influence for progress throughout the world.

Marvin Explains Purpose of Branch

DETROIT, MICH., Jan. 6—That the branch office established in the Ford building, Detroit, by the traffic department of the National Association of Automobile Manufacturers will aid automobile manufacturers to get cars through to their destination promptly and secure their return, is the statement of J. S. Marvin, of New York, general traffic manager for the N. A. A. M.

"When a manufacturer sends a car out on one road and the car must be turned over to another road before reaching its destination, we will beat the car and notify the second road that it is coming and to be ready for it," said Mr. Marvin. "We intend to keep after roads in the matter of rates the same as we have been doing for years. It is hard to get special automobile cars, although there are 45,000 or 50,000 of them in service. The reason is that automobile cars are used by manufacturers in other lines.

"It is rather queer, but it seems only a few days ago we were asking the railroads for special automobile cars, and now there are nearly 50,000 of them. At that we could use more. The Detroit office will have very little, if anything, to do with Detroit traffic congestion. We will leave that to the board of commerce, whose traffic department is handling the matter. We needed a branch office in the West and Detroit was the logical place."

Mr. Marvin announces that he will divide his time between the New York and Detroit offices. R. A. Gardner has assumed charge of the Detroit branch, coming from the Stoddard-Dayton company.

Lion Assets Bring $12,500 at Sale

DETROIT, MICH., Jan. 6—Referee in Bankruptcy Joslyn has effected the sale of the factory equipment of the Lion Motor Car Company, of Adrian, after the sale had been postponed twice on account of low bids.

The property goes to Samuel Winternitz & Company, of Chicago, for $13,000. At the first sale the highest bid was $7,000, and the second time it was offered Winternitz & Co., bid $12,500, raising their own bid the last time the property was offered. Attorney Charles L. Robertson was named as trustee in the proceedings.

The tangible property was appraised at $33,401.73. The various claims presented against the company when business was suspended amounted to $108,000. The actual amount of liabilities outstanding are estimated by Attorney Robertson at about $75,000.

Engler Heads G. M. T. Engineers

DETROIT, MICH., Jan. 6—W. B. Engler, for the last 3 years head of the engineering department of the General Motors heavy-duty gasoline truck plant at Owosso and previously with the Olds Gas Power Company, of Lansing, Mich., has been promoted to the post of chief engineer of the General Motors Truck Company, with entire charge of experimental and development work. The announcement is made by W. L. Day, vice-president of the company.

Mr. Engler has spent the last 3 months abroad in preparation for his new position, most of the time being spent in England, Switzerland, Italy and France.

Ricker Enters Broader Field

INDIANAPOLIS, Jan. 6—Chester S. Ricker, chief engineer of the Henderson Motor Company, has resigned to enter the field as a consulting engineer. He has been retained by the Henderson company in an advisory capacity. Mr. Ricker designed the six-cylinder model put out by the company and has recently completed an electric starter.

Castle Out of Lamp Company

CINCINNATI, Jan. 6—Fred E. Castle, who resigned the presidency of the Castle Lamp Company recently, has announced that he is not connected with the company in any way. Mr. Castle stated that his plans for the future have not been definitely formed.

$7,000,000 For U. S. M.

Reorganization Committee Bids That Sum For Assets of the Company and Court Will Rule by Friday on Offer

Flanders To Head Standard Motor Company, Which Will Take Over and Enlarge Old Concern

TWO bids, one for about $7,000,000 and the other to pay a percentage of the indebtednesses of the United States Motor Company and its subsidiaries, were made in the United States District Court on Wednesday. Judge Charles M. Hough received the bids and announced that he would rule which, if either, of them would be accepted by Friday.

The bidders were Henry C. Holt and William McAlister, acting for the reorganization committee. If one of the bids is accepted the property will be transferred to the Standard Motor Company, a Delaware corporation of which Walter E. Flanders will be president and W. J. McGuire, vice-president.

The receivers reported that the losses incurred in manufacturing since they took hold were $308,000 and that all the factories are closed as far as new work is concerned except the Briscoe Manufacturing Company. The Atlas Engine Works gave notice that appeal would be taken from any order of sale, but this will not serve as a stay to the proceedings.

INDIANAPOLIS, IND., Jan. 6—There was a new turn in the affairs of the Maxwell-Briscoe Motor Company, and the United States Motor Company last Friday when the Indiana creditors of the Maxwell company asked that that concern be adjudged bankrupt, the petition being filed in the federal court in this city. These same creditors filed a petition in the superior court here recently asking that the Newcastle plant be sold separately from the other Maxwell plants.

Franklin Raises Its Capitalization

SYRACUSE, N. Y., Jan. 6—The capital stock of the H. H. Franklin Manufacturing Company was raised from $300,000 to $1,500,000 at a meeting of the stockholders held Friday, January 3. The new stock consists of 9,000 shares of common stock of par value of $100 each and 6,000 shares of preferred stock, 7 per cent. accumulative, of par value of $100 each.

The increase in the common stock is made by a 200 per cent. stock dividend upon the present capital stock.

American-La France Refinancing

Additional capitalization for the American-La France Fire Engine Company has just been announced. The old company was capitalized at $2,900,000, divided into $900,000 bonds; $1,000,000 preferred stock and $1,000,000 common. It was found that the company required more working capital and a new issue of $2,000,000 of 7 per cent. cumulative preferred and $1,450,000 common was authorized to take up the old issues. The bonds will be retired from the proceeds of the sale and the floating indebtedness has already been liquidated from earnings.

Bill Heads Rambler Sales and Plant

KENOSHA, WIS., Jan. 6—(*Special Telegram*)—Important addition to the executive staff of Thomas B. Jeffrey Company, manufacturers of the Rambler, and promotions among prominent employees were given out today by President Charles T. Jeffrey.

Louis H. Bill, who for many years has had charge of the Pacific coast business, has been appointed assistant general manager in charge of both factory and sales. Mr. Bill was prominent in the bicycle industry and for the past 10 years has been actively identified with the automobile business on the coast. Harry E. Field, who formerly had in his charge the business of the company in New York and adjacent territory, becomes general sales manager with George H. Cox as his assistant. Field was formerly vice-president and general sales manager for the Hartford Rubber Works.

J. W. DeCou, is factory manager, while John Bjorn has been made assistant factory manager and general superintendent.

Two assistant superintendents have been appointed, including George N. Bliss, and M. Mattson.

Three general foremen have been named: William Martinson, C. P. Heide and H. Luthi.

The new officers of the company include president, Charles T. Jeffrey; vice-president, Harold W. Jeffrey; second vice-president and treasurer, George H. Barry; secretary, Edward S. Jordan and assistant secretary, Edward S. Haddock. The Jeffrey Company is the outgrowth of the old Gormully & Jeffrey Company

New Manager for Herreshoff Plant

DETROIT, MICH., Jan. 6—C. Stuart Somervell, until recently manager of the Lycoming Foundry & Machine Company, of Williamsport, Pa., manufacturers of automobile motors, has become general manager of the Herreshoff Motor Company, of Detroit. Mr. Somervell will perform a part of the duties hitherto falling to Charles F. Herreshoff, chief engineer and vice-president, the office of general manager being a new one.

Rubber Steadily Lower in 1912

During 1912 the price of the highest grade of crude Para rubber ranged between $1.22 and $1.01, the final quotation of the year was $1.09. Since 1909 something over 1,000,000 acres of rubber has been planted in the mid-East. Only a small propor-

Automobile Securities Quotations

Prices yielded slightly during the past week, due largely to the fact that the eyes of investors were turned toward the general market. A few of the specialties were higher but trade was small in volume. The feature of the trading was the strength displayed by Goodrich and the firmness of General Motors, Alco and Pope. Otherwise the market was pretty soft in spots. The automobile specialists were waiting for the sale of United States Motors and the developments to be announced following the sale.

	1911		1912	
	Bid	Asked	Bid	Asked
Ajax-Grieb Rubber Co., com	..	..	170	200
Ajax-Grieb Rubber Co., pfd	..	..	96	102
American Locomotive Co., com	36	37	43	43½
American Locomotive Co., pfd	105	106	104	106
Chalmers Motor Company	..	..	130	145
Consolidated Rubber Tire Co., com	5	12	13	14
Consolidated Rubber Tire Co., pfd	10	20	50	60
Firestone Tire & Rubber Co., com	178	180	320	326
Firestone Tire & Rubber Co., pfd	108	110	104	106
Garford Company, preferred	..	..	100	102
General Motors Company, com	34	36	32½	34½
General Motors Company, pfd	77	78	78	79
B. F. Goodrich Company, com	..	..	67	68
B. F. Goodrich Company, pfd	..	..	104½	105½
Goodyear Tire & Rubber Co., com	330	335	440	446
Goodyear Tire & Rubber Co., pfd	104	106	104	105
Hayes Manufacturing Company	..	..	..	90
International Motor Co., com	..	..	10	20
International Motor Co., pfd	..	..	40	60
Lozier Motor Company	..	..	..	35
Miller Rubber Company	..	..	160	170
Packard Motor Company, pfd	105	107	103	106
Peerless Motor Company	..	..	115	118
Pope Manufacturing Co., com	38	40	35½	36½
Pope Manufacturing Co., pfd	68	70	79	80½
Reo Motor Truck Company	8	10	9	11
Reo Motor Car Company	23	25	19	21
Studebaker Company, com	..	..	33½	35½
Studebaker Company, pfd	..	..	92	94½
Swinehart Tire Company	..	..	100	105
Rubber Goods Mfg. Co., pfd	100	105	104	108
U. S. Motor Company, com	..	..	..	..
U. S. Motor Company, pfd	..	..	..	..
White Company, preferred	..	..	104	107
Willys-Overland Co., com	..	..	71½	72
Willys-Overland Co., pfd	..	..	99	100

tion of this tremendous cultivated acreage is in the productive stage at the present time.

The plantations turned out 28,000 tons of rubber during 1912, approximately double the yield of 1911. Taking the natural percentage of trees that will come into bearing in 1913 and the natural increase of yield in the plantations already producing, it has been estimated that the cultivated rubber yield of the present year will not be far from 55,000 tons.

Automobile tire requirements for this year represent about the total rubber production of the world 15 years ago.

Col. Samuel P. Colt, president of the United States Rubber Company, states that the past year has been generally favorable for the tire makers. The spring business was poor on account of bad weather and a backward season, but the fine weather conditions of the fall evened the score.

Gasoline Still Making High Records

Wholesale prices of gasoline have been steadily advanced during the past year. Starting with the wholesale rate at 9 cents, the first few days of 1912 saw the price pushed up to 11 cents. Since that time the price has been advanced cent by cent until now a new high mark of 17 cents has been established.

This makes the retail price at least 20 cents, and from that level it ranges as high as 30 cents. Much irregularity was noted during the year as between various sections of the country. This is accounted for by the fact that quite a large number of contracts covering portions of the year had been made between wholesalers and the oil companies. With a very few exceptions these contracts have now expired and a more uniform, if less agreeable, condition obtains.

The oil companies declare that the law of supply and demand is working in the gasoline field, while the enormous advance in the price of oil securities and the tremendous dividends paid on these stocks is viewed with much interest by the consumers.

Market Changes for the Week

There was a pressure for steel in all sections, consequently there were freer offerings in the metal markets. Tin was heavy, weak and lower in the domestic market on Tuesday, with freer offerings at concessions of 15 to 20 points early in the day. Tin suffered a loss of $.45. Copper electric and lake declined $.00 1-8. Cottonseed oil rose $.06. In the chemical market, gasoline rose $.01 1-4, petroleum $.05, and lard oil $.02. Tire scrap, antimony, Bessemer steel, open-hearth steel, sulphuric acid, cyanide potash, fish oil, and Kansas petroleum remained constant throughout the week.

Material	Wed.	Thurs.	Fri.	Sat.	Mon.	Tues.	Week's Change
Antimony, per lb..	.09	.08¾	.08¾	.08¾	.08¾	.09¾	....
Beams and Channels, 100 lbs....	1.61	1.61	1.61	1.61	1.61	1.61	....
Bessemer Steel, Pittsburg, ton...	27.50	27.50	27.50	27.50	27.50	27.50	....
Copper, Elec., lb.	.17 5/11	.17 5/11	.17 5/11	.17½	.17½	.17½	—.00⅛
Copper, Lake, lb..	.17⅝	.17⅝	.17⅝	.17⅝	.17⅝	.17⅝	—.00⅛
Cottonseed Oil, Jan., bbl........	6.12	6.15	6.15	6.15	6.17	6.18	+.06
Cyanide Potash, lb.	.19	.19	.19	.19	.19	.19	....
Fish Oil (Menhaden), brown..	.33	.33	.33	.33	.33	.33	....
Gasoline, Auto, 200 bbls. @.....	.21	.21	.21	.22¼	.22¼	.22¼	+.01¼
Lard Oil, prime...	.92	.92	.92	.92	.90	.90	+.05
Lead, 100 lb......	4.25	4.30	4.30	4.30	4.32½	4.30	+.05
Linseed Oil, prime	.46	.46	.46	.46	.46	.46	....
Open-Hearth Steel, per ton........	28.00	28.00	28.00	28.00	28.00	28.00	....
Petroleum, bbl., Kansas crude....	.83	.83	.83	.83	.83	.83	....
Petroleum, bbl., Pa. crude.......	2.00	2.00	2.00	2.00	2.00	2.05	+.05
Rapeseed Oil, Refined	.69	.69	.69	.69	.69	.69	....
Silk, raw Italy....	....	....	....	....	4.35	4.35	....
Silk, raw Japan....	....	....	....	....	3.67½	3.72½	+.05
Sulphuric Acid, 60 Beaume.....	.90	.90	.90	.90	.90	.90	....
Tin, per 100 lb...	50.75	50.70	50.65	50.60	50.50	50.30	—.45
Tire Scrap........	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	.09⅞	....

U. S. Exports $2,107,721

Thirty-One Commercial Cars to a Value of $56,176—1,658 Passenger Cars to a Value of $1,750,890

Imports from the United States Have Steadily Risen During the Past Few Years

WASHINGTON, Jan. 6—During November, 1912, domestic exports of automobiles and automobile parts, not including engines and tires, from the United States amounted to a total value of $2,107,721. The exports were divided as follows:

Thirty-one commercial cars of a value of $56,176; 1,658 passenger cars of a value of $1,750,890, and parts of, $300,655.

Consular and trade reports received by the Department of Commerce and Labor continue to discuss the excellent field abroad for the American made motor machine. The American consul at Johannesburg says an especially good market for motor cars will be found at and around that city.

"While England still continues to sell most of the motor machines in that district," says the consul, "the imports of automobiles from the United States have steadily risen during the past few years and would, in the opinion of many, be much greater but for the fact that the prices charged the local agents by certain American firms having the exclusive handling of the machines in this country have been considerably in excess of the manufacturers' prices."

The consul continues:

"The imports of motor cars and parts into the Union of South Africa in 1911 amounted to $1,800,495 in value. Of these the United Kingdom furnished machines to the value of $1,172,549; United States, $208,000; France, $166,997; Germany, $147,784; Canada, $81,600, and Belgium, $15,878. The total from all countries is an increase of $400,000 over 1910, and the 1911 imports from the United States show an increase over 1910 of more than $50,000. The 1911 imports from the United Kingdom were $358,803 in excess of 1910. Both Germany and France show substantial decreases, while Canada increased its sales from $6,389 in 1910 to $81,600 in 1911. These Canadian sales are of a well-known American car (Ford) manufactured at and shipped from a branch factory in Canada."

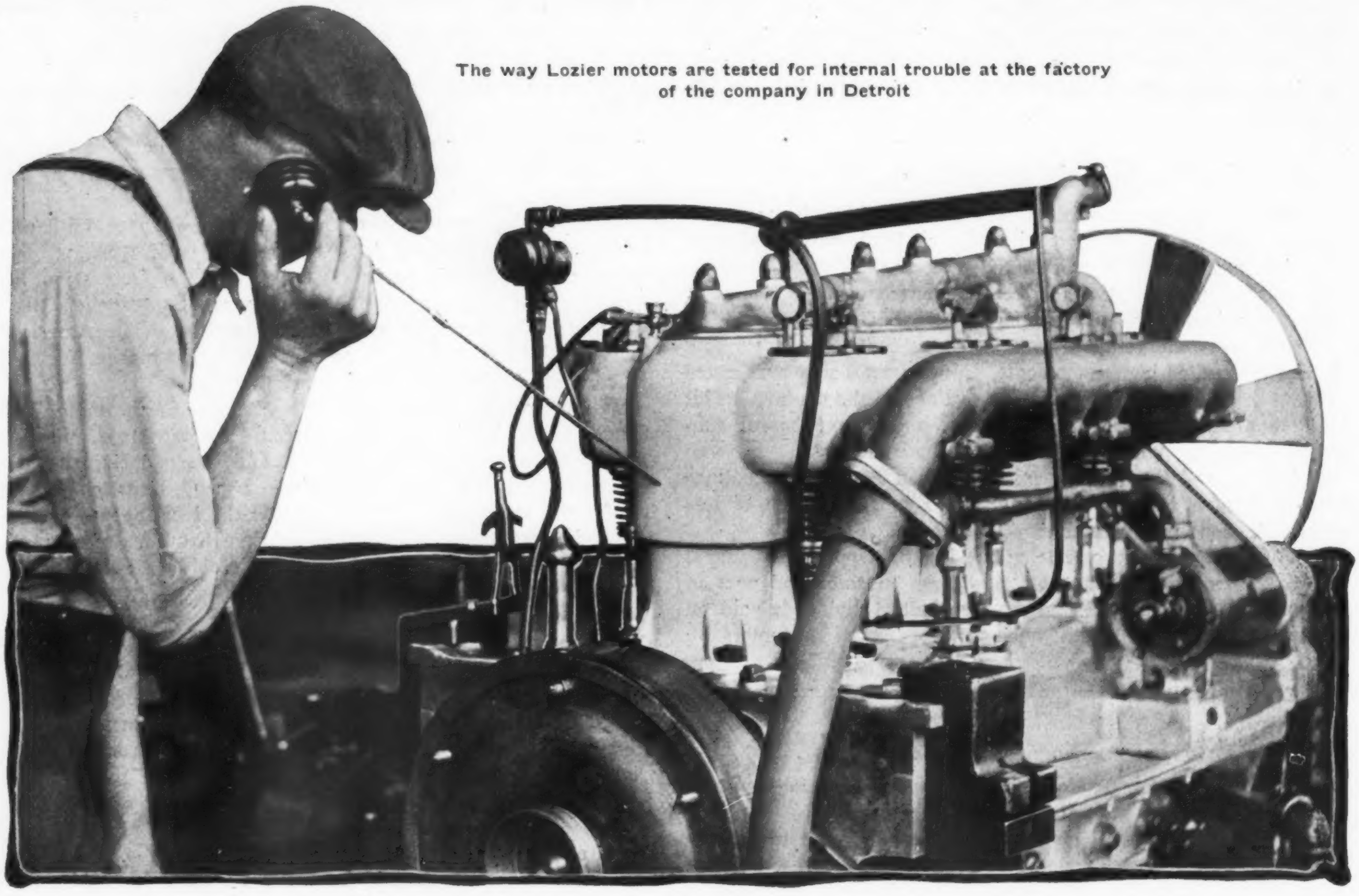
The American Consul at Sheffield says the use of the automobile is becoming more general in that city, and there is no reason why American manufacturers should not secure a share of the growing trade. He says there are a number of American

The American consul at Huddersfield says:

"The sale of American motor cars is rapidly increasing and the outlook for the future is good. The total registered motor cars in Huddersfield at the beginning of 1912 was 663. Of these 595 were pleasure cars and 68 were used for commercial purposes. The retail prices of the different grades selling range from about $730 to $4,150. The retail prices of cars most largely sold range from $2,430 to $2,675, complete. The horsepower employed is generally 12 to 20. The four-cylinder car, 14 horsepower, is popular. It is estimated that about 150 cars are sold in this district annually. Of this number probably 50 per cent. are French. A few of these are imported direct by way of the ports of Hull and Goole, but as this trade is chiefly carried on through general agencies the bulk of imported cars reaches this district indirectly.

"An effective method for advertising American goods and the efficiency of modern American manuacturing methods was a series of lectures, accompanied by motion-picture illustrations showing the various processes in motor-car production, given by a representative of a Michigan establishment. The lectures were held in one of the principal halls of the town."

Factory Miscellany



The way Lozier motors are tested for internal trouble at the factory of the company in Detroit

THERE is no marked similarity between the physician's office of a life insurance company and the block testing room of a motor car factory, yet they have points in common. Among the tests given in each place is that of the stethoscope. The physician uses it to detect irregularities of the heart, and the mechanic to discover any uneveness of operation in the motor.

While it serves the same purpose as the stethoscope, the instrument used in the high grade motor car factories is slightly different in appearance. It consists of a steel rod made of three separate pieces combined with a regulation telephone receiver. By placing the end of the rod against the side of a motor it is possible to locate the source of the smallest disturbance. The lightest of "valve slaps" or knocks in the engine are thus noted, allowing the correction of any fault before mounting the motor on a chassis. The road testers carry similar instruments as an extra precaution against the possibility of car being turned over to the sales department with a faulty motor.

The accompanying photograph taken in the Detroit plant of the Lozier Motor Company, shows a workman testing the exterior of a six-cylinder motor for interior trouble. In the same manner the entire car and running gear can be examined.

TIMKEN'S Glass House—The Timken Roller Bearing Company, Detroit, Mich., is building a new factory for the grinding of the cups, cones and rollers. The dimensions of the new Timken plant are 64 feet by 240 feet. It is of the latest saw tooth skylight roof construction and $100,000 of new machinery will be installed. The accompanying photograph conveys the impression it is a conservatory for tender young plants but in this instance it is, in truth, the half-clothed skeleton of that plant.

Fitzsimmons Erecting Factory—An automobile factory costing $12,000 is being erected in Lindsay, Ont., for J. A. Fitzsimmons.

Summers Establishes Factory—Summers Brothers, Glasgow, Ky., will establish a factory in Indianapolis, Ind., to manufacture a hydraulic transmission for automobiles.

Factory at Louisville—The Speedway Tire Company, incorporated under the laws of Kentucky, with a capital of $250,000, will build a factory in Louisville in the near future.

Scharf Gearless Builds—The Scharf Gearless Motor Company, Richmond, O., incorporated for $10,000, by G. W. Worden and others, will erect a plant to make a new gearless motor.

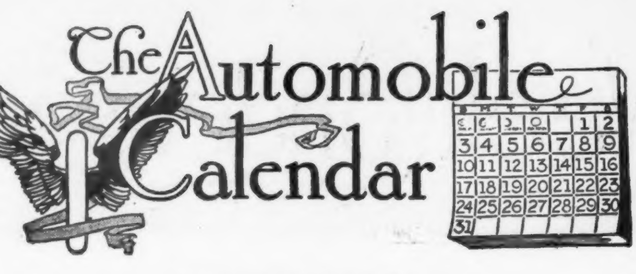
Brass Works on Fire—The Port Washington Brass Works, Port Washington, Wis., owned by John Meyer, sustained a total loss by fire due to defective wiring. The works will be rebuilt without delay.

Walloff Factory in Redcliff—It is stated that the Walloff Motor Company, of Minneapolis, Minn., has decided to establish a factory in Redcliff, Alta, and will commence work on the erection of a plant immediately.

Another Franklin Meeting.—A conference of the Franklin Automobile Company, Syracuse, N. Y., dealers of the Pacific Coast, Cleveland and Cincinnati, O., districts, will be held at the Franklin factory on January 10.

Wolverine Accessories Plans Factory—The Wolverine Motor Supplies Company, Detroit, Mich., manufacturer of automobile accessories, has had plans prepared for a two-story brick addtion to its plant, to be 74 by 84 feet.

Oldsmobile Factory Inspected—During the holidays the branch managers of the Olds Motor Works, Lansing, Mich., throughout the United States were invited to attend a meeting at the factory for an exchange of opinions on the past policies of the company and to assist in forming new features in the conduct of the business for the coming season. The most noteworthy event of the meeting was the concerted inspection and criticism of the new light Oldsmobile Six.



Shows, Conventions, Etc.

Jan. 2-10..........New York City, Importers' Salon, Hotel Astor, Importers' Automobile Alliance.

Jan. 4-11..........Cleveland, O., Annual Automobile Show.

Jan. 4-11..........Montreal, Que., Montreal Motor Show, Drill Hall and 65th Regiment Armory.

Jan. 11-18.........Milwaukee, Wis., Annual Show, Auditorium, Milwaukee Automobile Dealers' Association.

Jan. 11-25.........New York City, Thirteenth Annual Show, Madison Square Garden and Grand Central Palace, Automobile Board of Trade.

Jan. 18-25.........Philadelphia, Pa., Annual Automobile Show.

Jan. 21-26.........Toledo, O., Annual Show, Exposition Building, Toledo Automobile Shows Company.

Jan. 25-Feb. 1.....Montreal, Que., Montreal Automobile and Truck Show, R. M. Jaffray, Manager.

Jan. 25-Feb. 1......Providence, R. I., Annual Show, State Armory, Rhode Island Automobile Dealers' Association, Inc.

Jan. 27-Feb. 1.....Philadelphia, Pa., Truck Show.

Jan. 27-Feb. 1.....Buffalo, N. Y., Annual Automobile Show.

Jan. 27-Feb. 1.....Detroit, Mich., Annual Automobile Show.

Jan. 27-Feb. 1.....Ottawa, Ont., Ottawa Motor Show, Howick Hall, Louis Blumenstein.

Jan. 27-Feb. 1..... Rochester, N. Y., Annual Show, Exposition Park, Dealers' Association.

Jan. 27-Feb. 1.....Scranton, Pa., Annual Automobile Show, Hugh B. Andrews.

Jan. 27-Feb. 13....Troy, N. Y., Annual Show, State Armory, Troy Automobile Club.

Feb. 1-8...........Chicago, Ill., Annual Automobile Show, Coliseum and 7th Regiment Armory.

Feb. 3-8...........Washington, D. C., Annual Show.

Feb. 8-15..........Hartford, Conn., Annual Show, State Armory, Hartford Automobile Dealers' Association.

Feb. 8-15..........Minneapolis, Minn., Annual Automobile Show.

Feb. 10-15.........Chicago, Ill., Truck Show.

Feb. 10-15.........Winnipeg, Man., Show, A. C. Emmett.

Feb. 11-15.........Binghamton, N. Y., Annual Show, State Armory, Dealers' Association, R. W. Whipple.

Feb. 15-22.........Albany, N. Y., Annual Show, State Armory, Dealers' Association.

Feb. 15-22.........Newark, N. J., Annual Automobile Show, First Regiment Armory, New Jersey Automobile Exhibition Company.

Feb. 16-23.........Richmond, Va., Annual Show.

Feb. 17-22........Kansas City, Kan., Annual Automobile Show.

Feb. 18-19.........Madison, Wis., Annual Show, City Market Building, Dealers' Association.

Feb. 18-21.........Grand Forks, N. D., Annual Show, Auditorium, Dealers' Association.

Feb. 18-22.........Baltimore, Md., Annual Show, B. A. D. A.

Feb. 19-22.........Bloomington, Ill., Annual Show, Coliseum, McLean County Automobile Club.

Feb. 19-22.........Geneva, N. Y., Automobile Show, Armory, Louis Blumenstein.

Feb. 19-23.........New Orleans, La., Annual Show.

Feb. 19-27.........Topeka, Kan., Annual Show.

Feb. 20-22.........Canadaigua, N. Y., Automobile Show, Louis Blumenstein.

Feb. 22-Mar. 1.....Brooklyn, N. Y., Annual Show, 23rd Regiment Armory.

Feb. 24-27.........Kansas City, Mo., Truck Show.

Feb. 24-Mar. 1.....St. Louis, Mo., Annual Show.

Feb. 24-Mar. 1.....Memphis, Tenn., Annual Show.

Feb. 24-Mar. 1.....Omaha, Neb., Annual Automobile Show.

Feb. 24-Mar. 1.....Paterson, N. J., Annual Show, Paterson Automobile Trade Association.

Feb. 24-Mar. 5.....Cincinnati, O., Annual Show, Music Hall, Cincinnati Automobile Dealers' Association.

Feb. 26-Mar. 1.....Fort Dodge, Ia., Annual Show.

Feb. 26-Mar. 1.....Glen Falls, N. Y., Automobile Show, Louis Blumenstein, Manager.

Feb. 27-Mar. 1.....Toronto, Ont., Annual Show, Toronto Automobile Trade Association.

March 3-8.........Pittsburgh, Pa., Annual Automobile Show.

March 3-18........Des Moines, Ia., Annual Show, Pleasure Car Section, Coliseum, Dealers' Association.

March 5-8.........Tiffin, O., Annual Show, Tiffin *Daily Advertiser*.

March 8-15........Boston, Mass., Annual Automobile Show.

March 12-15.......Ogdensburg, N. Y., Automobile Show, Louis Blumenstein. Manager.

March 12-15.......Louisville, Ky., Annual Show, Dealers' Association.

March 18..........Syracuse, N. Y., Annual Show, Syracuse A. A.

March 19-26.......Boston, Mass., Annual Truck Show.

March 20-24.......New Orleans, La., Annual Show, N. O. A. D. A.

March 24-29.......Indianapolis, Ind., Annual Automobile Show.

Jan. 6............New York City, Meeting Motor Dealers' Contest Association.

Jan. 14............New York, Beefsteak Dinner, Big Village Motor Boosters.

Jan. 15............New York City, Banquet, Waldorf-Astoria, Motor and Accessory Manufacturers.

Jan. 16............New York City, Meeting, Hotel McAlpin, Society of Automobile Engineers.

Jan. 16........... New York City, Dinner in Honor of W. H. Blood, Jr., Retiring President, Electric Vehicle Association of America, Delmonico's.

Jan. 17............New York City, Banquet, Hotel McAlpin, Society of Automobile Engineers.

Race Meets, Runs, Hill Climbs, Etc.

May 30............Indianapolis, Ind., 500-Mile Race, Speedway.

Building $100,000 Plant—The Canadian Standard Automobile & Traction Company, with a capital of $250,000, is calling for tenders for the erection of a factory at Moose Jaw, Ont. The factory is to be 250 feet by 50 feet, its value with the machinery and plant being $100,000.

Moon Installs New Machinery—The Moon Motor Car Company, St. Louis, Mo., recently installed a considerable amount of costly new machinery in its rear axle department. The Moon rear axle department is now equipped to turn out a new rear axle evrey 20 minutes.

Palmer-Moore Leases Plant—The Palmer-Moore Company, Syracuse, N. Y., has started the manufacture of a truck with a 2-cycle motor with throttle control and with a capacity of 1,600 pounds, has leased the plant formerly occupied by the Syracuse Stove Works in North Geddes street, and will move in the early part of January.

McNaul Tire Moves—The McNaul Auto Tire Company, Toledo, O., has moved into a three-story brick building on Superior street, formerly occupied by the Merrill Company. The place is being remodeled and redecorated. The McNaul company manufactures a tire which is practically punctureless and has outgrown the old quarters on Cherry street.

To Build Wizard Plant—P. S. Florea, O. C. Forbes and E. H. Habig, Indianapolis, Ind., have organized the Wizard Motor Company, which has been incorporated with an authorized capitalization of $50,000. A factory is to be leased immediately, and motors adaptable to cycle cars will be manufactured. J. L. Yarian has been engaged as factory superintendent, engineer and designer.

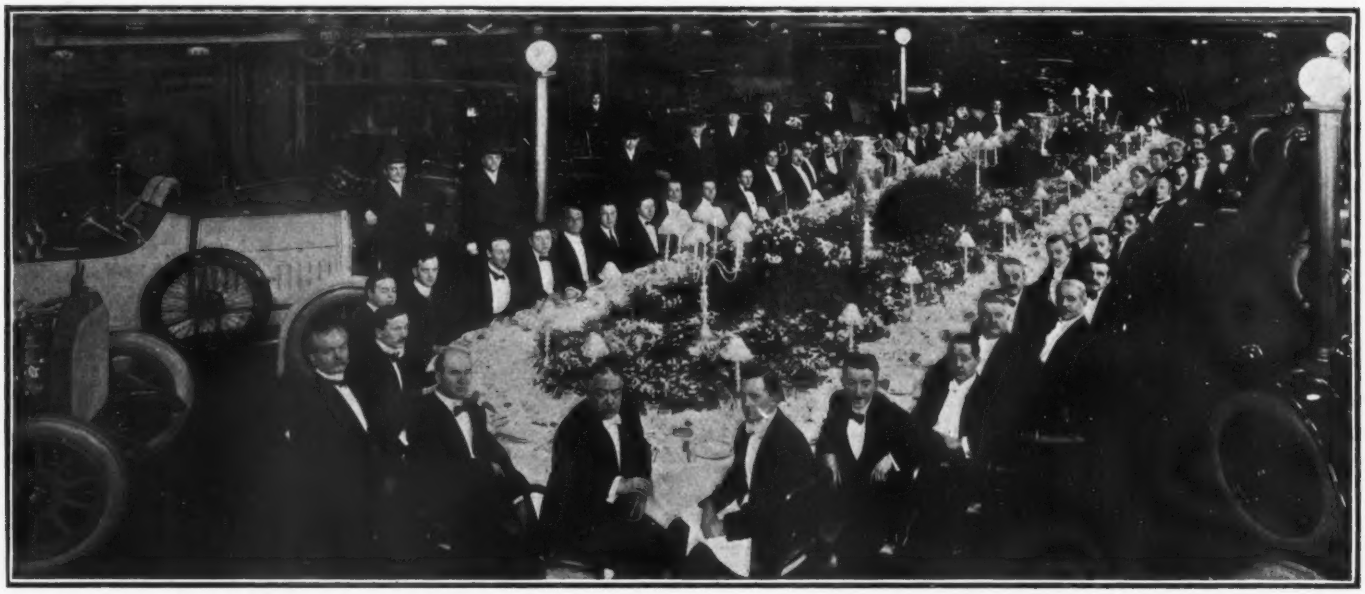
Plan Automobile Factory—A project which is now on foot, in which some Coshocton, O., people are interested, may result in the establishment of an automobile factory in that city within the near future. It is planned to use the old Premium Manufacturing Company building and there to assemble cars, the parts of which will be made at other points. Indiana parties are interested in the deal and J. C. Baughman of that city is taking care of the local end of the planning. The company expects to make cars valued at $2,000 and $2,500, and to assemble them.

How Moon Tests Motors—Whenever an engine is put on the testing block in the Moon Motor Car Company's factory, St. Louis, Mo., it is directly connected by means of coupling to another engine which is running under its own fire; the engine under fire drives the engine which is being worn in until the latter is in position to work under its own fire when dynamometer tests are made and the engine which passes the inspection test goes to the chassis assembly room, while the other engine, which is just beginning to work under its own fire, in turn now wears in a fresh engine, just out of the assembly room.

Reo Plant Completed—The new three-story, 252 feet by 252 feet, shipping and assembling plant of the Reo Motor Car Company, Lansing, Mich., was completed on December 2. This increases the floor space 190,512 square feet and provides shipping and assembly accommodation for 1,600 automobiles. Its floors are cement. It is equipped throughout with the latest improved automatic sprinkling system. An overhead runway connects it with the main factory buildings, thus providing a convenient easement to and fro for all traffic. Its covered shipping platform cares for twenty 40-foot box cars at one time, giving a loading capacity of 120 cars per day. The incoming freight is cared for on a separate track, which runs direct to the main factory buildings. From present indications the 1913 Reo output will far exceed 30,000 cars.

New factory addition of the Timken Roller Bearing Company, Detroit, Mich., to be used for the grinding of cups, cones and roller

News of the Week Condensed



Dinner of the Importers' Automobile Alliance held in the grand ballroom of the Hotel Astor, New York City, to celebrate the opening of the Thirteenth Annual Importers' Salon

IMPORTERS' Alliance Dines—The Importers' Automobile Alliance celebrated the opening of the Thirteenth Annual Salon in the grand ballroom of the Hotel Astor, New York City, last Thursday evening. The table was spread in the midst of the cars on exhibition and was decorated with the Vanderbilt Cup and the Elgin Trophy. Besides the importers and other automobile men, the automobile editors of the Metropolitan dailies and the editors of the national motor journals were present.

Paris with Reo—R. E. Paris has joined the Reo Truck Company, Lansing, Mich.

York Has 540 Automobiles—According to a recent count made by the York, Pa., police department there are 540 persons in that city owning automobiles.

Atlanta Buick Branch Moving—The Southern branch of the Buick Motor Company, Flint, Mich., is moving into its new Peachtree street building, Atlanta, Ga.

Scharlach Sternberg Manager—H. L. Scharlach has been appointed manager of sales for the Sternberg Manufacturing Company, makers of commercial vehicles, Milwaukee, Wis.

West Chester's Fire Engines—The Borough Council of West Chester, Pa., has decided to purchase three motor-driven chemical engines, one for each of the fire companies there.

Universal Adds Worm-Drive—F. K. Parke, general manager of the Universal Company, recently announced the addition of a one-ton worm-drive truck to the company's 1913 line.

Wilmington Banquet Date Changed—The Delaware Automobile Association has changed the date of its annual banquet from January 23 to 27. It will be held at the new Hotel Dupont.

Motz Factory Branch Opened—A factory branch house of the Motz Tire & Rubber Company, of Akron, O., was opened in St. Louis, Mo., recently. It is located at 4378 Olive street. E. G. Deibel is in charge.

New Automobile Bus Line—An automobile line from Lancaster, Ky., to Lexington will be started within the next fortnight. The promoter is the same company which has been running a line from the Madison capital to Lexington.

Studebaker Discontinues Louisville Branch—The Studebaker Corporation, Detroit, Mich., has discontinued its Louisville, Ky., branch. No wholesale business will be transacted hereafter and the retail end of the Studebaker concern will be handled by the Rommel Motor Car Company.

Mills on World Trip—D. B. Mills, president of the Rajah Auto-Supply Company, Bloomfield, N. J., and Mrs. Mills, are in California. On February 6, they will leave San Francisco for a trip around the world, returning home about June 1.

Doering Sales Manager Gramm—H. H. Doering has become a member of the executive staff of the John N. Willys industries, as sales manager of the Gramm Motor Truck Company, Lima, O. He will make his headquarters at the plant.

Galvin Resigns—H. J. Galvin has resigned from the Remy Electric Company, Anderson, Ind., to become president and general manager of the Galvin Specialty Company, also of that city. This company will manufacture and market gasoline machines for heating garment-pressing and laundry machinery.

Louisville Show March 12—At a recent meeting of the Louisville, Ky., Automobile Dealers' Association it was decided to hold the sixth annual exhibition of the organization March 12 to 15. The show will be held in the First Regiment Armory. Mr. P. S. Longest, secretary of the association, will handle all applications for space.

Important to Garage Owners—Garage owners in Cincinnati, O., will be vitally interested in the recent decision by high courts that where a machine is left in their care, and proper watch is not bestowed thereon, to the result that such car may be stolen or damaged, the proprietor of the garage is himself financially liable.

Pennsylvania Issues 59,365 Licenses—During 1912 the automobile division of the Pennsylvania State Highway Department issued 59,365 licenses, the highest number known since the establishment of the bureau. The licenses represent an income of $598,000. In 1911, 44,272 cars were licensed. The 24,000 mark in 1913 licenses was reached recently.

Wilmington Helps Visiting Automobilists—For the benefit of visiting automobilists who are passing through Wilmington, Del., the street and sewer department, which has control of the streets, has erected large signs on lamp posts in different sections of that city giving directions to the next towns and showing the streets and roads to follow. The signs, which are of sheet iron, are painted black, with silver lettering, making the words and finger marks very clear.

New Agencies Established During the Week

PLEASURE CARS.

Place.	Car.	Agent.
Boston, Mass.	Brown	F. E. Wentworth.
Bayfield, Wis.	Studebaker	William Bassett.
Canton, O.	Moon	Auto Service Co.
Cleveland, O.	Rambler	W. H. Barger Co.
Columbus, O.	Winton	Winton Sales & Repair Company.
Correctionville, Iowa	Cole	A. M. Rogers.
Dows, Iowa	Cole	C. W. Broeffle.
Hanford, Cal.	Paige Detroit	H. R. Cousins.
Harrisburg, Ill.	Moon	Chas. V. Parker.
Humboldt, Tenn.	Cole	Lannon & Johnson.
Joplin, Mo.	Moon	Joplin Supply Co.
Los Angeles, Cal.	Speedwell	Dwight Holmes.
Louisville, Ky.	Cole	Geo. Dunham & C. L. Anderson.
Macon, Mo.	Moon	Macon Garage Co.
Manhattan, Kans.	Cole	Gordon Belt Auto Company.
Marcus, Iowa	Moon	Johnson, Petty and Johnson.
Melbourne, Australia	Tudhope	W. B. Veirs.
Milwaukee, Wis.	Flanders Six	Hughes-McDonald Motor Car Co.
Milwaukee, Wis.	Garford	Hughes-McDonald Motor Car Co.
Mitchell, S. Dak.	Moon	Central Auto Supply Co.
Nashville, Tenn.	Lozier	Union Motor Car Company.
New Orleans, La.	Lozier	Automobile Maintenance Company.
Oakland, Cal.	Paige Detroit	Osen & Hunter Auto Co.
Oakland, Cal.	R-C-H	C. C. Eichelberger.
Ozona, Tex.	Cole	Ozona Auto Company.
Pasadena, Cal.	Cole	Lieber-Coryall Motor Car Company.
Passaic, N. J.	Lozier	Nathaniel Finch.
Phillips, Wis.	Cutting	Hunt Auto Sales Co.
Phillips, Wis.	Chevrolet	Hunt Auto Sales Co.
Phillips, Wis.	Ford	Hunt Auto Sales Co.
Phillips, Wis.	Herreshoff	Hunt Auto Sales Co.
Phillips, Wis.	Little	Hunt Auto Sales Co.
Phillips, Wis.	National	Hunt Auto Sales Co.
Quincy, Ill.	Cole	Machinery & Motor Company.
Sacramento, Cal.	Paige Detroit	Skinner & Elliott.
San Angelo, Tex.	Cole	Wm. R. Ede Company.
San Francisco, Cal.	Paige Detroit	A. E. Hunter Auto Co.
San Jose, Cal.	Flanders Six	William J. Benson.
Sherman, Tex.	Cole	Roberts Electric Company.
Stockton, Cal.	Paige Detroit	J. C. Skinner.
Texarkana, Tex.-Ark.	Moon	Paul Jones.
Union Hill, N. J.	Lozier	Union Automobile Company.
Vancouver, B. C.	Detroiter	H. W. Chambers.
Washington, Mo.	Moon	C. A. Krumsick.
Webster City, Ia.	Lozier	Hansen & Tyler Automobile Co.
Winnipeg, Ont.	Cutting	The Palace Garage.

COMMERCIAL VEHICLES.

Los Angeles, Cal.	Speedwell	Dwight Holmes.
Milwaukee, Wis.	Garford Truck	Hughes-McDonald Motor Car Co.
Montreal, Can.	Mack	Canadian Fairbanks Morse Co.

ELECTRIC VEHICLES.

Milwaukee, Wis.	Ohio Elec.	Hughes-McDonald Motor Car Co.

Vancouver Receives Glide—South Vancouver, B. C., recently received a 45-horsepower Glide, to be used as a combination police patrol and ambulance.

Schwartz Joins New Company—S. A. Schwartz has joined forces with Edward McKelvey and H. Walling, in organizing the S. A. Schwartz Oil Company with headquarters in Columbus, O.

Ziegler Goodyear Manager—H. P. Ziegler was promoted on January 1 to the position of general manager of the Chicago, Ill., district of the Goodyear Tire & Rubber Company, Akron, O.

Burnside in Insurance Field—F. H. Burnside, of San Francisco, Cal., has been appointed special agent and adjuster for the Firemen's Fund Insurance Company in the Pacific northwest.

Newark Concern Changes Hands—The C. W. Thompson Manufacturing Company, of Newark, O., has been taken over by W. A. Tungs and will be rehabilitated and extended. The concern produces a patent automobile tire clamp.

Tampa's Flying Automobile Squadron—Tampa, Fla., recently purchased a 6-cylinder Hudson, which is being used by W. M. Mathews, chief of the fire department. The car is equipped with chemical extinguishers and other apparatus for fighting fires.

Aldrich Resigns—Owing to a nervous breakdown, G. B. Aldrich, who has been general manager of the Dayton Automobile Truck Company, Dayton, O., has tendered his resignation to become effective at once. He still retains his holdings in that company.

Martin Tractor in Ottowa—Representatives of the Martin Tractor Company, Indianapolis, Ind., were in Ottawa, Can., recently with a view of making their Canadian headquarters in that city. This company manufactures motor tractors for pulling fire engines and other vehicles.

Eagal Resigns—J. H. Eagal has resigned his position as district manager of the Oldsmobile Company, Tacoma, Wash., and has accepted a position with the Consolidated Motor Car Company of San Francisco, Cal. Mr. Eagal will have charge of the commercial department.

Hughes and McDonald Join—O. R. Hughes, Marshfield, Wis., and John McDonald, Jr., Milwaukee, Wis., have joined forces and organized the Hughes-McDonald Motor Car Company, Milwaukee, Wis., to represent the following lines: Garford, Flanders Six, Ohio electric and Garford truck.

Colorado's New Road—Preliminary surveys for the new automobile road from Colorado Springs to Cripple Creek, Colo., have been completed and work will start next spring. The road is to be built along the Colorado Springs stage line through Cheyenne Canon. The government has appropriated $2,000.

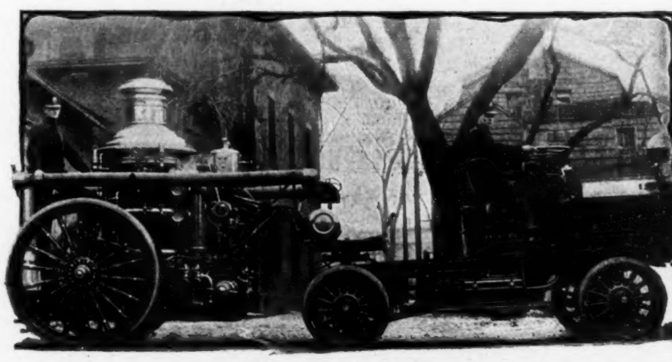
Toronto's Show February 20—The Toronto, Ont., Automobile Trade Association's show will be held from February 20 to March 1, 1913. Three buildings—the new Dominion Government, the Transportation and the Horticultural—will probably be utilized, and their combined floor area will provide all the space that is likely to be required.

Victoria Show Postponed—Owing to its inability to secure suitable quarters close in or to get the only ones at all available, except in the rainy season, the Victoria Automobile Dealers' Association recently postponed the automobile show at Victoria, B. C., until autumn, when it will join forces with the agricultural exhibition in a building of its own.

Road Building Delayed—Nearly 100 road petitions asking for in the neighborhood of 300 miles of water-bound pike in Ohio have been found invalid by the Circuit Court through a recent decision of the State Supreme Court declaring the Garret road law invalid. This decision will mean that the building of new roads in the country will be delayed for some time.

Change in Tacoma's Course—Plans are now on foot to make a decided change in the Tacoma, Wash., automobile race course which will mean the shortening of the track from its present length to approximately 5 miles to 3 miles to 3 1-2 miles. There are two dangerous curves near Lakeview and it is planned to cut off the road altogether through the town of Lakeview.

Regal in France—R. M. Lockwood, representative of the Regal Motor Car Company, Detroit, Mich., in France, has completed a deal in Paris which will place the sale of his product and all other American made cars in all the provinces of France. He has established a garage which is a formidable appearing structure with a capacity for 400 automobiles. Its management is backed with a capital of 1,250,000 francs.



Gasoline-electric tractor and steam fire engine combination recently installed in the service of the Hartford, Conn., fire department. The gas engine used is of the T-head type with 5.5-inch bore and 6-inch stroke and is direct coupled to a 125-volt generator. Drive is from four motors, one for each wheel, of 88 volts. The current is controlled through a street car type of controller

Steinhauer General Manager—F. P. Steinhauer has been employed by the Colby Motor Company, Mason City, Ia., as general sales manager.

Seibel to Manage Motz—A branch factory of the Motz Tire & Rubber Company, Akron, O., has been established in St. Louis, Mo., with E. G. Seibel as manager.

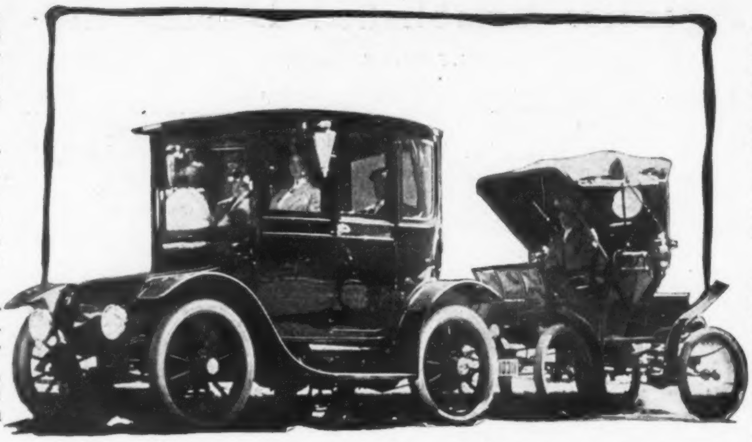
Stone with Landman-Griffith—M. Stone, formerly with the Gamble Motor Car Company, Toledo, O., has accepted a position with the Landman-Griffith Company, of that city.

Portland Club Increasing Membership—The Portland, Ore., Automobile Club is making strenuous efforts to increase its membership to 1,000 before 1913. The membership fee is now but $10 but will be raised to $25 on that date.

Carnahan Resigns from Swinehart—F. G. Carnahan will sever his connection on January 15, 1913, from the Swinehart Tire & Rubber Company, Cleveland, O., to assume a position with F. G. Carnahan & Company, Akron, O., dealers in rubber stock.

South Bend Forbids Speed—The board of public safety of South Bend, Ind., has adopted resolutions forbidding the drivers of automobiles of the police and fire departments from driving their machines at a rate of speed greater than 30 miles an hour.

McGiehan Resigns—T. H. McGiehan has resigned his position of manager of the New Orleans, La., branch of the Goodyear Tire and Rubber Company, Akron, O., to accept the position of general manager of the Motz Tire and Rubber Company, Akron, O.



Another meeting of the new and the old, bringing forth strikingly the advance in electric car construction during the past decade. The car in the foreground is a 1913 Baker brougham, while that in the background is a Baker stanhope built 12 years ago

Eagal Resigns—J. H. Eagal has resigned his position as district manager of the Oldsmobile Company, Tacoma, Wash., and has accepted a position with the Consolidated Motor Car Company of San Francisco, Cal. Mr. Eagal will have charge of the commercial department.

Frisco's Truck Club.—The San Francisco, Cal., Motor Truck Association is the name of an organization of motor truck men of that city recently organized. At the meeting there was considerable enthusiasm displayed, and it was the general belief that there was a very wide field for the activities of such an association. Its immediate formation was the result.

Pennsylvania Improves Roads—Since the Pennsylvania highway department took over 8,000 miles of highways in the state on June 1, the department has improved 4,700 miles of roads. This total includes those that have been rebuilt under the seventy-nine contracts so far let under the Sproul act and those that have been repaired by the road superintendents, forty-seven of which have been named out of fifty the law calls for.

Canada Has 21,290 Automobiles.—The popularity of the automobile in Canada, and incidentally the prosperity of the Canadian farmer, is shown in the latest statistics. According to the figures there are at present 21,920 automobiles in Canada, or about one car for every 323 inhabitants. The rate varies considerably in the different provinces, Nova Scotia having only one automobile per 851 people, while in Alberta there is a car to every 125 inhabitants. British Columbia ranks next as a motoring province.

Incorporations of Automobile Companies During the Week

AUTOMOBILES AND PARTS.

Albany, N. Y.—Electric Coach Corporation of New York City; capital, $500,000; to manufacture and engage in the motor vehicle business. Incorporators:

Boston, Mass.—Norwalk Motor Car Company; capital, $75,000. Incorporators: Charles C. Smith, James W. Briggs, M. A. Beaudet.

Boston, Mass.—Lozier Motor Car Company; capital, $1,000. Incorporators: Ralph B. Nettleton, Stanley G. Barker, Robert S. Barlow.

Chicago, Ill.—A. W. Goeiner Auto Sales Company; capital, $25,000; to manufacture automobiles and accessories. Incorporators: A. W. Goeiner, Michael Feinberg, C. E. Becker.

Cincinnati, O.—Hermes Motor Car Company; capital, $30,000; to manufacture automobiles, trucks and accessories. Incorporators: Albert Kloybolte, Powel Croslet, Jr., Charles Eissen, Slater H. Aiken, John C. Rogers.

Dover, Del.—Standard Motor Company; capital, $31,000,000; to manufacture, construct, maintain and operate automobiles, wagon trucks, motor cycles, flying machines. Incorporators: Donald Muhleman, Wm. J. Maloney, Herbert E. Latter.

Jersey City, N. J.—The Wheel of Fortune Corporation; capital, $600,000; to conduct a general automobile business. Incorporators: L. H. Gunther, H. A. Black, J. R. Truner.

Louisville, Ky.—Miller, White & Company; capital, $5,000; to deal in automobiles. Incorporators: R. W. Miller, A. W. White, William Atix.

Morgantown, W. Va.—Chaplin-Dille Motor Car Co.; capital, $25,000; to manufacture and deal in automobiles, trucks, aeroplanes, etc. Incorporators: B. M. Chaplin, M. C. Wildman and Jas. E. Dille.

Morristown, N. J.—Morristown Automobile Company; capital, $25.000; to conduct a general automobile business. Incorporators: J. J. Lyons, L. Van Gansbeck, Alex. Newmark.

Newark, N. J.—Universal Motor Truck Company of New Jersey; capital, $50,000; to deal in motor trucks, etc. Incorporators: John Kramer, Grace Cleveland, Pasquale Mauan.

New York City, N. Y.—Drouet & Page Company; capital, $10,000; to manufacture motors of all kinds. Incorporators: Conrad Milliken, Ingrid E. Larsen, Martin B. Rofman.

New York City, N. Y.—Electro Coach Corporation; capital, $500,000; to manufacture automobiles. Incorporators: John Larkin, Alexander Andrews, Richard J. Lynch.

New York City, N. Y.—Standard Motor Company; capital, $31,000,000: to manufacture, construct, maintain, store, care for, sell and deal in and with automobiles, etc. Incorporators: Donald Muhleman, W. J. Maloney, Herbert E. Latter.

New York City, N. Y.—E. J. Sullivan Corporation; capital, $5,000; to conduct an automobile business. Incorporators: Robert C. Ballantine, Eugene J. Sullivan, Walter F. Hopper.

Port Clinton, O.—Holmes Tractor Company; capital, $50,000; to manufacture farm tractors of all kinds. Incorporators: George H. Holmes, George W. Sloan, R. S. Galleher, A. R. Laschinger, F. S. Dennernberg.

Rochester, N. Y.—Ball-Washburne Motor Company; capital, $25,000; to manufacture and sell motors. Incorporators: Ward H. Ball, Charles H. Washburne, Asa R. Ball.

Washington, D. C.—American Motor Traffic Company; to operate and manufacture motor vehicles for all uses. Incorporators: E. S. Alford, S. J. McFarren, W. J. Moore, A. L. Kley, J. C. Muncaster, J. C. Menoher.

GARAGES AND ACCESSORIES.

Albany, N. Y.—New York Motor Speedway Association; capital, $1,000,000; to hold aeroplane, auto and motor vehicle races, displays and contests. Incorporators: William B. Allen, Herbert J. Carter and Alfred B. Casner.

Buffalo, N. Y.—United States Rubber Reclaiming Company; capital, $2,400,000; to manufacture and deal in rubber goods, tires, etc. Incorporators: Theodore W. Bassett, Rudolph A. Lowenthal, Cornelia Beebe.

Jamestown, N. Y.—Eagle Garage Company, of Jamestown; capital, $25,000. Incorporators: Samuel B. Robbins, Olive M. Spencer, George Rappole.

New York City, N. Y.—New York Motor Speedway Association; capital, $1,000,000; to construct a motor speedway for racing. Incorporators: William B. Allen, Herbert J. Carter, Alfred B. Casner.

New York City, N. Y.—Stewart-Warner Speedometer Corporation; capital, $25,000; to manufacture speedometers. Incorporators: Elmer E. Holmes, J. K. Stewart, C. B. Smith.

Portland, Me.—Portland Automobile Dealers' Association; capital, $10,000. Incorporators: Fred A. Nickerson, Albert M. Spear, Jr., Ernest E. Brewer, Luther C. Gilson.

San Antonio, Tex.—Motor Car Supply Company; capital, $5,000. Incorporators; C. P. Guthrie, H. B. Wyne, James Harrison and Will Harrison.

West Seneca, N. Y.—The George Schuster Garage & Sales Company; capital, $5,000; to conduct a general garage business. Incorporators: Jacob F. Berner, Sr., Reinhold C. Berner, George Schuster.

Williamson, N. Y.—Williamson Garage Company; capital, $20,000; to manufacture and repair automobiles. Incorporators: Robert Carr, Charles DeZutter and Alfred F. Raymer.

Winnipeg, Can.—Dominion Garage; capital, $250,000; to conduct a general garage business.

CHANGES OF NAME AND CAPITAL.

Carrolton, O.—L. & M. Rubber Company; increase of capital from $120,000 to $500,000.

Cleveland, O.—Cleveland Auto Livery Company; increase of capital from $10,000 to $25,000.

Hartford, Conn.—Universal Auto Company; capital increased from $3,000 to $30,000.

Syracuse, N. Y.—H. H. Franklin Manufacturing Company; increase of capital from $300,000 to $1,500,000.

Youngstown, O.—Auto Rubber & Cycle Company; change of name to Auto Rubber and Mill Supply Company.